Mill Men and Filers'

HANDY GUIDE

BY M. COVEL.

WITH GENERAL INSTRUCTIONS FOR

HAMMERING SAWS,

THEIR CARE AND USAGE,

— ALSO —

M. COVEL'S SAW SHARPENER

— AND —

COMPLETE SAW BENCH.

Plates and Figures representing all Implements to be spoken of, and how can be best managed will appear in their respective places.

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THE CARE AND MANAGEMENT —) OF (— MILL SAWS.

PREFACE.

The following is compiled with a view of conveying to "Mill Men" such instructions as will be of intrinsic value to them, in the care and management of saws; giving such points as will enable them to produce more lumber, and of a better quality from timber used.

The following instructions are more espe-

cially directed for the grades of saws that will be prominently mentioned, as also some other subjects closely connected with the foregoing.

The great desideratum of producing lumber at the lowest cost, is of the utmost importance in this age, and any thing that will reach that end should be sought for and adopted by all that are engaged in the business. The greatest source of annoyance is the saws ; and anything that will benefit these should be adopted.

I shall, as briefly as possible, introduce some things that are original with myself, as far as I know, as also many more that I have obtained from the best authorities in the country ; I have gathered in the last five (5) years, by going from one mill to another, and thus learning the experience of over a thousand of the best millwrights, filers and sawyers in the United States and the Canadas ; and at the same time have had experience in upwards of one hundred of the best mills.

And for the past twenty-five years I have

made the saw my constant study, in regard to the handling, and to get at the best possible results for its work.

I have had experience with all kinds and makes of saws, which has given me more practical knowledge than any other man in the country, both in hammering and dressing them. I sought and acquired this knowledge for the purpose of furnishing mill men with such mechanical tools that would enable them to accomplish more and better work from their saws ; and with what I have gained and gathered by my own experience, I am enabled to furnish such machines and tools as will enable any one to make a favorable difference in their mills of from five to twenty-five per cent. in the cutting capacity, and from three to five per cent. in the stock which is going to sawdust.

I have carefully watched all the changes made in saws for the last twenty-five years, and with some, improvements have been made, yet many, no improvements; which, of the

latter, manufacturers are trying to force on unskilled mill men, and seemingly with success, and when the worthless product is brought into use it will not meet the requirements. I do not claim any more credit than other strangers, until you are better acquainted; nor do I wish any one to take my word solely, but test what I have to offer, and I know satisfaction will be the result.

I will furnish any number of references if desirable to establish the validity of my statements and that too within the reach of any mill man.

The experience I have had cannot be acquired by what can be learned in a dozen mills. The more of arts and the larger the field, the more information there is to be gained. I do not claim to have learned all there is to be learned, but probably as much as can well be of utility at the present. With the world's stride, knowledge should keep pace; one must become educated to things new, in order to be successful in their use. Many of the things I shall

offer are old, and many men thoroughly familiar with, yet there are a large number that are entirely ignorant of, and many points that have been abandoned by good men, owing to circumstances which have wrought changes (but in reality of no importance to them) while others have seen good points and to advantage. I propose to discard such as has but little merit, although at times can be used with success. I meet a great many skeptics in regard to some things I advocate, because they were old, and when used were condemned from other than the right causes. Now what one man can do with a saw another can do also, if the saw is kept in the same condition and under like circumstances.

DRESSING OF SAWS.

There are but few men that dress their saws properly, and if they have different saws will fail to dress them alike. It is often said they cannot file saws uniform because they do not run uniform, every saw will run the same if in the same condition, the reason they are not is simply because the filer does not understand how to test them, nor how to remedy the defect when found.

No saw should be dressed any other way but right, that is both sides alike, and accurately round and in balance. These are points every one wishes to accomplish, and think they do, but I have never found any one yet, that does it so that it cannot be bettered. And what is right for one saw, applies with equal force to another.

That in the shape of the teeth, each tooth should come in contact with the timber alike—or all at the same angle. This is a fact that is hard to be done, but with the right kind of a machine will accomplish it if properly managed. No one should go to extremes in any case, there is always a medium point and it has been

my endeavor to ascertain where that is—and point it out, more particularly with saws than any other implement. What I may offer will give the best of results if followed closely. A great many will impracticably follow them and because they do not accomplish what I claim they will, condemn all my implements and recommendations, and fall back in the old way. Now, if such have anything better and keep the same to themselves, it will never benefit others. There is no tool in use that there is more demanded of it than the saw, and no implement more misused. The success of mills depend upon the saw, therefore it does not pay to employ unskilled men to have the care of them, and the demand is such for skilled labor, that but few of that class are to be had. The frequent inquiry I have had for good filers and sawyers has led me to furnish such instructions to mill men and filers, that they can get along more successfully than they now do.

I will endeavor to point out in detail, what will make the most successful runing saws, and will try to make it so clear, that any one may gain the benefits of my time and expense spent in this line to acquaint *myself upon the subject.*

It would take the best part of a life-time to get the experience necessary to become a No. 1 mechanic, and the only way to learn from one another is to be teachable on the ground of science and experience. The time has come, when it is essential for a filer to thoroughly understand the hammering of saws, as that constitutes a part of his business, and he cannot be counted a first class filer until he has that acquirement. There are a great many filers that could with the instructions this is designed to give, enable them to hammer their saws and have better success in runing them after becoming fully acquainted with instructions and follow them to the letter, as it is very nice work, and requiring the utmost care, therefore one cannot be too careful as it calls for close judgment and workmanship.

There are some points I shall explain that are ahead of anything now in use, which will enable a new beginner to accomplish more work alone, than some of the old hands now can with a helper. Filers that can hammer their saws and do it right, are worth to employer three dollars per day more than one that cannot.

The simple expense of hammering saws, is

not where the difference comes in, it is in always having the saw ready to do its work. If a filer understands the hammering, and has the right kind of tools to do it, and can examine the saw every time it comes off the arbor, and if it does not run right, remedy the evil at once, that would save all the trouble that is now experienced with poor running saws.

A delay of 15 minutes in a day would make the difference of 3 to 4 dollars in some mills. It is not necessary for a saw to stop to compute a loss, but may occur by favoring the saw when it will not stand up to the regular feed. Then it is best to take it off the arbor at once, and find where the trouble lays, but as a general thing they are favored through the tour, and then filed to lead them one way or the other, getting in one difficulty, in order to overcome another. In such cases the trouble at first is slight, but under such treatment the saw becomes worse, and in a few days it is in such shape you cannot do anything; and thus the lost time accruing, will be sufficient to pay the expense of hammering it several times, besides the poor lumber that has been made, and the result is in many instances of a broken saw,

more than half of the saws broken is for the want of care, allowing them to get in such shape they will dodge on the side of the log, leaving it full enough to crowd the saw over the collars till it gives away, no saw will vary from a straight line without a cause, and any man that understands a saw, will examine and see where the defect is. Heretofore filers had no means convenient but their eye, to detect imperfections in the filing of them, but with my saw-sharpener, it is an easy matter to know if the saw is dressed right, and to keep it so. While heretofore they would change the saw by giving it lead one way or the other, and try again, and generally after trying several times they could do nothing with it, and then send it to some one to hammer that knows but little more than the filers. When a man understands testing the saw, and use of the hammer, five or ten minutes' work will put the saw to rights.

I will give here full instructions how that may be done, accompanied with cuts showing the defects in saws, and the method of repairing; and also give definite points that will obviate the much trouble in the past with saws.

THICKNESS OF SAWS.

The changes that have been made with saws in the last 25 years, the majority of mill men and filers know but little of, changes that have been made in the mean time have been many. When the saw was first being used, no one knew any thing about hammering them open, it was thought the stiffer the plate the better. Then they were all made straight gauge. Following came the taper ground saw, which has been in use 20 years, and is still in use by the majority of mills. Now I would like some one to bring forth proof, that could not successfully be gainsaid, that it is to the benefit of saws, to have the plate thicker in the center than elsewhere, and convince me of any benefit that could be thus derived. For it would be far easier for me to be convinced that I am wrong, than to make $^{3}/_{4}$ of all the men using these, that they are wrong. But since the motion of saws have been increased, the extra steel which is in the center is a detriment to the saw, in room of a benefit—it is well known

that a saw will not be successfully run when it is stiff in the center. I would by all means prefer it thinner there than otherwise. My reasons for it are: first, a straight saw will run with less set; second, it requires less hammering to put the saw in the right condition for good running. The less set, the less power it takes to drive it, the lighter it cuts, the less liable it is to buckle, and dodge; every thing that will lighten the running of saw, should be sought for by all interested in their use.

For a long time there were but few changes made, that materially benefited the running of the saw, but within the last five years there has been much discovered that has nearly doubled its capacity. And other things when better understood, will add to this efficiency 25 per cent. more than is now realized by the majority of mills.

At the present time many mills are running thinner and straight gauge saws, some are making a success of straight 8 gauge 60 inch., some do well with 10 gauge 72 inch. I have faith and confidence that 5 years will not have passed, before 10 gauge saws will be run with

as much success as is now being done with 8 gauge. With what has come under my immediate observation in the hammering of saws, and the improved machinery in dressing them, will enable mill men to accomplish what they have heretofore failed to effect.

SPEED OF SAWS.

There should be a standard speed for saws, the speed necessary to accomplish the best work should be the one adopted. Although there are matters of opinion to be settled which vary from 7 to 15 thousand circular feet per minute. Now there must be a point somewhere between these numbers, that the saws will do the best.

Saws have been run with the above speed, and I have made this a special point, as it is very essential to know which is just right.

Saws can be run at any speed between the above number mentioned, but there is a medium point, one that the saw will do the best work.

My experience has led me to adopt ten thousand circular feet per minute, as the medium speed for all saws, no matter what the size of the saw is, what is right for one, is right for another, or as near that as may be; 500 or 1000 feet variation is hardly perceptable, although I would much rather have just the right speed, but it will vary slightly as the saw wears smaller.

Were there such a rule adopted, it would result in the end of a great saving to mill-men, and also enable saw-makers to furnish such as would give better satisfaction, as they could have a fixed rule to hammer them to.

There will no doubt be some that cannot see it; as they may have the idea the faster the motion, the larger will be the pile of lumber, but that does not always follow, for what you gain in speed, you lose in feed. I have never known it to fail. If you get below 10,000 feet per minute, then you cannot carry the feed. To those that cannot maintain the motion with the power they have, it would pay far better to increase the power, then you can make a success of saw milling.

There is a limit to saws as to speed, and

the capacity of cutting lumber. It is natural for men to experiment, and is all right so to do, for that is the way best results are reached. But to those that do not wish to spend time and money in so doing and are willing to accept my experience, they will save the time to themselves I have spent to inform myself on the subject. I have no selfish motives in offering this book, further, than to give such information as will be of the greatest benefit.

To hammer saws for a higher rate of speed, the saw will require to be open so much that it will dish either way, that should never be done; in such a case where the saw becomes warm in the center from the arbor that will expand the center and cause the saw to lop whichever way the strain is. Where the speed is 10,000 feet the saw can be hammered so it can vary 100 revolutions per minute, and then make good lumber.

With so many opinions about the speed, it is hard to furnish saws which will be the best adapted for the work. There are a number of things that can be done that will enable most any one to run their saws to the right speed.

If you lack power, reduce the feed until the speed is maintained; many may think by that they cannot cut so much lumber, but the majority of mills will cut more, for what you lose in feed you gain in speed.

Some mills are lacking in power and motion by not running the engine fast enough, if the engine were run faster as a rule that will accomplish the desired result. If that cannot be done, then there is another remedy which will give better results, that is reducing the number of teeth in the saw, or reduce the cutting surface of the teeth. In ordering a saw that will give the best results, go through your yard and measure the cuts on fifty boards that have been cut on different days, then average the cut, and whatever it amounts to, multiply by 16, that will give the right number of teeth, and dress the tooth like as cut No. 2 letter C.

SAW GAUGES.

A few suggestions with other facts, I will now speak of relative to this subject.

There should be a standard gauge for saws, and on a scale that one could determine their thickness to a nicety. The way gauges number as will be seen, are from four to twenty, this makes it difficult to arrive at the real thickness of the saw plates, yet the following numbers will come very closely to it: A 30 gauge saw is $\frac{5}{100}$ of an inch in thickness, and a 6 gauge is $\frac{20}{100}$, and therefore the gain and loss in lumber must be in ratio corresponding with the gauge; from 20 to 30 gauge, the difference is $\frac{1}{200}$ of an inch to each gauge, one-half less than the lower numbers proportionately.

Were there a regular gauge scale adopted, then one could tell what fractions of an inch in each gauge for the relative thickness.

I will give as I advance a table of the actual thickness of saws, represented by number of

gauge, or within $\frac{1}{100}$ parts of an inch as the actual average, commencing with No. 4, and thus to No. 20 inclusive, as the latter number is as thin as is in present use at this time ; and this table will be more accurate than the majority of the saws now are, as well as more replete and comprehensive.

TABLE SHOWING THICKNESS OF SAWS AS PER NUMBER OF GAUGE, IN HUNDREDTH PARTS OF AN INCH:

No. of Gauge.	4	5	6	7	8	9	10	11	12
Thickness in numerical 1-100 part of inch.	23	22	21	20	19	18	17	16	15
	100	100	100	100	100	100	100	100	100

No. of Gauge.	13	14	15	16	17	18	19	20
Thickness in numerical 1-100 part of inch.	14	13	12	11	10	9	8	7
	100	100	100	100	100	100	100	100

The benefit of the above table will be obvious, and enable any one to calculate the

percentage saved or lost, by using the different gauged saws, and to decide which would be the most successful to carry.

There is a medium point in feed as well as anything else, where the saw will make better lumber and more of it. If you overtax a saw, the sooner it will give out, at present the average feed carried in mills, does not exceed $4\frac{1}{2}$ inches, although some carry 6 and 10, and in other cases no more than three inches is carried, by close observation while I have been among the mills, I do not find it to exceed more than 4½ inches. The average number of teeth in saw is not far from 64, that would allow each tooth to cut $\frac{8}{100}$ of an inch each revolution.

The average gauge of saws used is about No. 7, and width of cut is 3 gauges or $\frac{23}{100}$ of an inch, or a little less than 25 per cent. of the stock, is converted into saw dust, and some as high as 30 per cent. Whoever uses 4 or 5 gauge saws, loses about 33 per cent. of their stock. It is a general thing among small mills, where the power is light, that they use thick saws, the principal reason for this is, the lack of the right knowledge of the saw, and how best to care for them. These instructions are

designed more especially for this class of millmen, and where there will be the greatest benefit gained, such feed should be carried that will enable the saw to be maintained in its speed, and at the same time, not to tax the saw beyond its strength. Much more feed can be carried if the teeth are in the right shape, and have the proper hook, or the back kept in shape to produce an easy cut. The shape and number of teeth regulate the feed. It is desirable to carry such feed as the saw will stand up to, and make good lumber, by adding more teeth more feed can be carried, 10 per cent. more lumber can be cut with the same power, and at the same time increase the quality of it five per cent. on an average.

If you are lacking of power, it will be far better to reduce the feed or the cutting surface of the teeth.

NUMBER OF TEETH FOR SAWS.

I ascertain that by the amount of feed I wish to carry. I allow a tooth to every $^{1}/_{16}$ of an inch feed regardless the size. I have found the most successful running saws to be those that carry the above feed, although many saws are crowded far beyond that limit, but if there were more teeth added, so that each tooth will remove but $^{1}/_{16}$ of an inch of timber, the saw would do better work, and could be crowded to double that in light cuts through soft wood; but in hard wood I would allow 20 teeth to remove one inch of timber.

There are but few saws that cut hard wood, that carry more than three inch feed, the average feed in hard wood is less than two inches. The above number of teeth can be used either sprung set or full swage; when that is done, it adds double the number of corners to the saw, and such saws can be crowded harder and will make smoother work, but will require more force to remove the same amount of timber.

I have given the number of teeth for 6 and 7 gauge saws. If you wish to run thinner saws, it would be preferable to add more teeth, as the thinner the saw, the lighter chip should be taken. I will below give the number of teeth to each gauge of saws, necessary to remove five inches of timber to each revolution of the saw, to wit:

6	gauge	saw	should	have	80	teeth,
7	"	"	"	"	86	"
8	"	"	"	"	94	"
9	"	"	"	"	110	"
10	"	"	"	"	126	"

The above is for circular saws. It matters not about the size of the saw, so long as you wish to carry five inch feed to the revolution.

The above number of teeth will carry five inch feed if the tooth is kept all right without swaging, see page 34, but if you wish to run full swage, the saw will cut some smoother and require more power to drive it. Whenever it takes more power to drive the saw, there is more strain upon it, and is more liable to buckle, and when there is an uneven strain or buckle, in the saw, it will not stand up as well as if it were straight and well balanced.

The number of teeth has much to do with the running of the saw. There is such a thing as having too many teeth, as also not enough, and to get at the right number, it requires study and practice to arrive at the best results, both in feed and thin saws, as to governing the number of teeth a saw should have.

THE SHAPE OF TEETH.

It is of the utmost importance to the successful running of the saw, the shape of the teeth, which, as a rule but little attention is paid to by majority of filers, every man has his own ideas of putting a saw in order, and consequently all cannot be right. It is well known among first class mechanics, that when a cutting tool is brought in contact with the surface to be re-removed at a certain angle, the chip is removed with less power, and this tool must be ground so that both sides are together at the right

angle to produce the desired results. This rule applies with equal force to wood as well as iron.

There is a fixed law that cannot well be evaded, and the nearer one keeps to it, the better and more favorable success he will have in any branch of labor.

Carpenter's plane, bits, chisels, &c., cut lighter when held at the right angle to the work. A saw is a duplicate to all of these, and governed by the same laws, although are imperfectly understood by the majority of mechanics as well as mill men. And the first thing that should be sought by mechanics is to hold and grind the cutting tool in that way that it will cut with the least power.

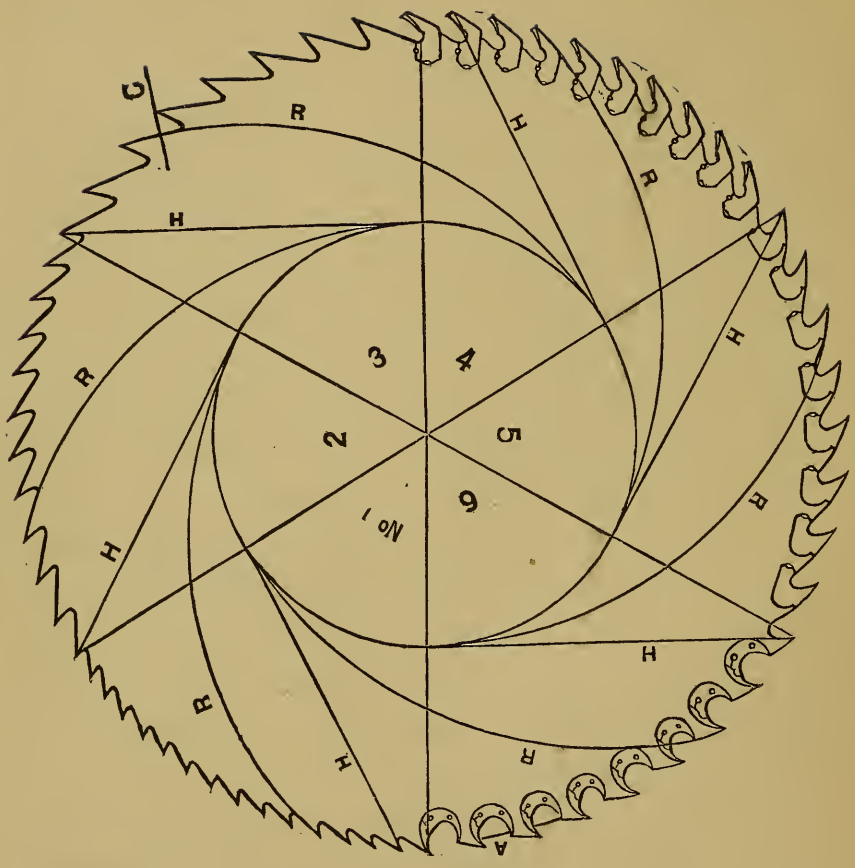
The saw is the most sensitive tool in use, and one that should be handled by the best skilled mechanics, and be kept as near perfect as possible. Ninety per cent. of the sawyers and filers are men that have been brought in contact with the saw usage, without ever having the first principle of the same explained to them. Through actual necessity, they have acquired such knowledge as was obtainable by their own experience, which has generally been very limited, and if any one discovers points where

there are benefits gained, they are like most of patentees, conclude that their discoveries they will not reveal to another.

The following cut illustrates six different saws, with as many different kinds of teeth, all laid out by a rule, which will make the lightest running saw, and one that will bring each tooth in contact with the timber all at the same angle. It matters not what the size of the saw is, or the number of teeth in the saw. I have tried this rule thoroughly, and find it to be the only rule that will apply to all sizes of saws.

Some manufacturers send out their saws with the tooth very near right, but with no instructions as to what shape should be maintained, in order to keep the warrantee of the saw good. This rule applies to, as you see illustrated on next page, Cut No. 1.

The lines H and R come together at angle of 30 degrees, and the tooth comes in contact with the timber at an angle of 40 degrees. These two angles produce the best cutting point and will make the lightest running saw. To lay out this shape tooth, divide the distance between the center and point of the tooth, and and then strike a circle as is here shown. This



CUT NO. 1.

is known as the quarter line, H is the hook line, that comes in contact with the timber at an angle of 40 degrees. R or radious is found

by setting the dividers to strike the circle same size of the saw. Place one point of divider on point of tooth, and the other upon circle or quarter line forward of the center, and strike line as shown by R and H, that come together at an angle of 30 degrees, producing a thin cutting edge like a chisel or plane, but not blunt like cold chisel edge, that the saw dust will not be cut, but pounded out. Whenever you find by examination of the saw dust, that one end of the grain is broken, you can make up your mind that the teeth are not in the right shape. then if you carry too heavy feed, the timber will be broken and not cut. When the chip is more than ⅛ of an inch in length it will be broken off. That is the reason the saw should have more teeth, and kept in the best possible shape, and by the above suggestions being maintained, the work will be perfected; any variation from this will produce undesirable results.

I fully understand the difficulty filers would have in keeping the tooth in the right shape with the appliances they have in the file room at the present time. The depth of the teeth with the proper amount of throat

room for saw-dust, is very essential ; you can have too deep a tooth and too much throat as well as not enough, and one is as bad as the other.

Most every filer knows that their saw does not do as well when first gummed as it does after the tooth gets down to the best depth. If there is any one point where the saw will do better work, that is the point or depth of tooth to run, extreme measures always spoil the object sought for. My experience has been that half the distance from point to point makes the best shape tooth with the proper throat, unless the teeth are over three inches apart, if so 1½ inches deep, then strike a line from H to R, that will give a tooth that will not choke or clog under any reasonable amount of feed. When the tooth is too deep, the tooth will spring and tremble more and cause the saw to dodge more readily and stand less feed. If there is any one point wherein the saw runs better, it is best to run it in that way.

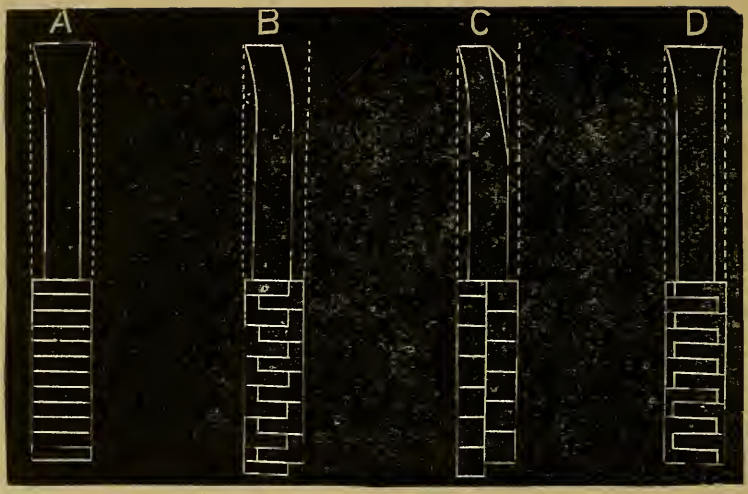
But it is an impossibility for any man to maintain one shape tooth, yet that is what they all try to do with present appliances.

After twenty years' careful study and practice I have been successful in perfecting a machine that maintains the shape of the tooth, and keeps the same to the desired depth with more accuracy than is possible to do with any other machine in use, and enables filers to overcome such difficulties as they have heretofore been unable to do.

IN FITTING THE POINT OF THE TOOTH.

There are various opinions with regard to the most economical way to accomplish this, some claiming one way, some another. I will here endeavor to give the best points that are gained.

The annexed cut shows the different ways in filing them; A is a full swaged t[illegible], dressed square and of proper shape and showing the cut in each tooth, by the cross lines at the bottom extending clear across, and this



CUT NO. 2.

saw has double the outside corners than is shown by the others, and cuts across ⅓ more timber than B, but does not cut so far ahead on the outside of the cut; with full swedging, if you have plenty of power, such a tooth is all right.

Now most men claim that such saws run lighter, but that is a mistake, it takes power to drive a tooth through the timber, the wider the surface, the more power it takes, and the greater is the strain on the saw. Many claim that if a saw is spread full, it cannot dodge nor the set get out, the latter is true, but the former is not, for the saw is more liable to dodge when crow-

ded, and the more power it takes, the greater is the strain and more liable to buckle, and whenever it buckles, it will not run straight. No saw will vary from a straight line without it first becomes sprung or buckled, from too much pressure upon it or getting strained and bent. Bad filing will produce a buckle or lead as some term it. In this style of dressing, both outside corners should be kept full and sharp, with the outside of the point dressed at an angle of 15 degrees, such a tooth will run 6 hours without losing enough of the corner to become round on the outside. The objection to this tooth, is, 1st: It will take about 25 per cent. more power to drive it than a sprung set tooth; 2d: It will cost more to keep such saws in order if the swaging is done by hand. Disston & Sons say: "By getting over this extreme spread, we could afford to make our saws 20 per cent. harder in temper, which would be of great benefit to them, and at all times run with much less set."

If saws were 20 per cent. harder, there would be 50 per cent. less saw hammering done. Then when the saw was rightly hammered, it would stay so much longer.

The advantages and disadvantages of the sprung set tooth as shown by letter B: At the present time many are using the swage tooth, and have discarded the sprung set for lack of knowledge how to file them properly. The advantage to be gained by sprung set: they will run 25 per cent. lighter when fitted right, as in reference to B, and cross lines shown at the bottom, you will see that the points of the teeth do not cut so much timber by one-third, and that leaves the tooth to cut double of the distance ahead on one side, and the same as swage tooth on the other. The chip will remove easier by cutting half way across the cut. By examining the cut you will see there is less cutting surface to this tooth than that of A, and a quarter more than C. The tooth is slightly bevel on the under side, and flat on top, the side corner should be sprung close to the point as shown in the cut, second, saws will last twice as long by spring setting, and cost less in files and emery wheels to keep them in order.

Men have discarded sprung set teeth for two reasons; first, for lack of teeth. If there was on an average one-fourth more teeth

added to sprung set saws than there now is used, there would be better running saws.

By reducing the thickness of the plate two or three gauges, that would make a saving of 10 per cent. in power and relieving that much strain upon the saw, at the same time saves three per cent. of the stock.

The disadvantage of the sprung set teeth claimed by some, is that the teeth become thinner on the point; that is no detriment to it as long as the tooth cuts to the center of the cut as shown by C.

I do not find that difficulty with them, when the tooth is set right. The sets in general use it is difficult to spring the tooth close to the point, but with one constructed properly, and the teeth once set, it is not half as much work to keep them set as it is to upset them. If you are lacking power, it would be best to use a thinner saw, and fit the teeth like C. This tooth will take nearly 40 per cent. less power if fitted this shape, and make 15 per cent. better lumber on an average. By examining the cut you will see that each tooth has cut only half the timber that A does across the cut, but 1/3 less than B. At the same time each tooth cuts the

same distance into the timber, and each tooth has 25 per cent. wider shoulder to strike against, which will prevent the tooth dodging or sliding off the shoulder (as is liable to do, when half swaging and sprung set is used as shown by D.) If this tooth is sprung set, with the inside corners filed off to the center of the cut, it will leave a narrower point to be driven through the timber with a heavier body of steel back of it for a support, not like A the widest on the point with ¼ less steel back to support the cutting point. I have used this shape teeth and seen others use them with the best results; most every one dress this shape tooth as Disston directs.

I do not follow his instructions fully. I do not use the swage but rather use the set, and one that will spring the teeth as shown in the cut. I have endeavored to show the outside corners as near perfect as possible to represent on paper, and what is to be gained by swage or upset is to keep the outside corner sharp, every one side-dresses the teeth after they have swaged or upset the tooth, that leaves the corners sharp and should also be done with sprung set teeth, and by keeping the tooth sprung

close to the point, it will not wear off enough to cause the tooth to be full below the edge, as it will get to be when it is not side-dressed. The object of having the tooth beveled on the bottom, is that it may present a full sharp corner on the outside, and give a cutting edge that will wear longer than a square bottom, and such an edge will work better in cross grained timber than one that is square, the bevel should be slight but what most men would call square.

When the saw is filed from both sides that is sufficient for the bevel, but it is almost an imposibility to make both sides alike with a file, and if they are not alike the saw will not run as well.

The only way that the saw can be dressed successfully is by a machine that will work accurate, heretofore there has been a lack of skill and not the proper kind of machines to do the work.

With my saw-sharpener I can dress a bevel or square tooth with that accuracy that has never been obtained by hand, or with any other machine. It will make any shape tooth desired, and keep the saw always in the best possible shape.

THIN SAWS AND WHAT IS THEREBY GAINED.

This is a subject of interest to all parties engaged in the manufacture of lumber.

Timber is becoming too scarce and expensive to waste 25 per cent. of it in saw dust. And what can be saved from this loss is clear gain, which is fully understood by nearly all, and many have thus tried to run thin saws but have failed for the lack of knowing how to run them and how they should be made. There are three principal causes why they are not running 3 or 4 gauge thinner saws than those they are at present.

Thin saws can be run when handled as they should be. The first cause wherein most have failed is not having the proper number of teeth.

The next point is the lack of skill to fit the teeth. It is not all in the filing but much depends in the hammering of the saw; six or seven years ago 8 gauge saws were as scarce as 10 gauge now, and did not have any better success with them then than is obtained with the 10 now.

I have seen 10 gauge 72 inch saws run in hard wood and carry as much feed as was carried 10 years ago in soft timber by 8 gauge and with good results. Men are improving the saw all the time, and in less than five years there will be as many 10 gauge saws in use as there are 8 at the present time.

It is a more particular job to file a thin saw than a thick one, but with the use of my saw-sharpener all such difficulty is obviated. With the number of teeth in table and in the right shape, with point of tooth fitted up like C and hammered open right, there will be no trouble in running them successfully and do as well as the 8 gauge saw can do. It requires skill and knowledge in the care of them, both in hammering and filing.

With my sharpener and the instructions for hammering that I will give, will enable millmen to have better success with their saws than they now realize or have had in the past.

INSERTED TEETH.

It is claimed by some that inserted tooth saws will do better than solid.

My experience has not demonstrated that fact. I have never found them to make as good or as much lumber ; they are more expensive than the solid. It costs more for teeth inserted than for the same amount of steel in the solid saw, although some men get along better with them than with the solid, as they do not have so much work to do, and there are less teeth to be filed and kept in order, and have no gumming to do, thus making them a favorite among filers. The saw does not get out of balance so readily as a solid one will under the care of same men, some will work the spaces uneven by filing, and in the solid ones the spaces become so uneven that one side of the saw has from 5 to 10 per cent. more labor to perform than the other. Such saws will never run right and will require hammering often. In making this statement it is not derogatory to solid teeth but against

those that file them, whereas with the use of my machine the teeth are put in the right condition and can always be kept so. The less pieces to a saw the better, and if the filers understand their business, they can make the solid saw do more work and do it better than the inserted tooth saw, so much so that the gain will pay for a new saw every six months.

There is nothing gained by maintaining the size of the saw as claimed for inserted teeth.

I will here refer to what Messrs. Emerson, Smith & Co. of Beaver Falls, Pa., say, in their hand-book on saws, page 77, in regard to solid teeth, viz: "We do not pretend that any inserted tooth saw for a single dash, is the superior of the solid tooth saw. Because when the teeth of the solid tooth saw are full length with good throat-room for the dust, and the tooth in perfect order with power to drive it, no inserted tooth saw can be made that will cut more lumber in as short a time." If solid saws will do better by having the teeth in proper shape, then it will pay to keep them so, and you will have the most successful running saw.

My experience has been the same as that of Emerson, Smith & Co. I know that a solid

saw will do better work when kept in order than an inserted tooth saw.

Filers are prone to favor inserted tooth saws, on account of the less number of teeth to file, and by favoring the saw regardless of how much is lost in this way by the mill-men, and so long as they do not find the difference or that the mill cuts one or two thousand feet per day less, that much is not missed, or they may make more lumber with a new inserted tooth, and thus is led to believe he has made great improvement by the use of the inserted tooth saw. It is well that at the present time mill-men are becoming awake to the necessity and benefit of using the solid saw.

The points I claim is to use a saw that will do the best work. If the solid saw has the right number of teeth and in the right shape, no inserted tooth saw ever made can make the quality or quantity of lumber that the solid saw will when kept in perfect order.

PATENT GROUND OR TAPER SAWS WITH STRAIGHT GAUGE.

Many claim a great benefit in the use of this saw, when that idea was instituted, mill-men began to increase the motion or speed of the saw; that caused it to lop over, then to overcome that, the manufacturers conceived the idea of the taper saw in order to make it stiffer, and soon the mill-men wished to run the saw faster. This necessitated another change, and the manufacturers began hammering the saw open in the center, this they found to be an improvement, and continued grinding the saw tapering and hammering it until the saw became open in the center. Could any one give me a reasonable excuse for the extra steel in the center, when the first thing they do before it will run, is to hammer all the stiffness out of them? Just the reverse of what the steel is left for; such saws require more set to clear the center and prevent heating. The wider the set of the saw the more strain on the rim, and the wider the cut the less feed can be carried.

The wider the cut the more liable the saw is to buckle. As soon as you give the saw room to spring, the less feed can be carried.

The saw should have a support on its sides, but you must have clearance enough to prevent the saw from heating. All the above difficulties will occur by having the center too thick. Some are getting back to straight saws and find them to do better.

I would rather have a saw two gauges thinner in the center than thicker. Such a saw will run very nice with fine teeth. If the rim is the heaviest it will straighten up and run steady more like the rim of a fly-wheel. These saws will not feel the uneven spots caused by the hammer as much as a thick center. Then you can carry lighter set on such saws and give more of a support to them, and prevent their buckling, when the saw is straight the center will not heat so much nor break, where, under the same circumstances, a thicker one would; the thicker the plate the greater the damage. If you bend a thick saw it is liable to break in remedial of so thick a body, whereas if the plate was $\frac{3}{100}$ of an inch thinner it would not break.

The thick edge with less set, have less timber to remove and more steel to do it in proportion. Such saws will not require so much hammering to make them stand up as the heft of the rim is a great help to it. The foregoing may be new to a great many, but such a saw has been successfully run in some places and is no theory of mine, but an actual experiment. I have seen such a saw, and that has been in use for the last four years.

Some will no doubt ask, why has not this saw been brought into use before this? I will say there is a patent on it, and the case has been in Court about three years and that is the reason there has been nothing more done. It takes some time to get men to adopt any thing that is new, especially when the reverse of things in general use, these saws will yield more readily under the same treatment, and when men become educated in using the thin saw, there will be more of them used year after year. If mill-men will adopt straight gauge saws, they will have less trouble with them than with others. That would be the saw I should use under all circumstances and not thicker than 8 gauge; the points in favor of such a saw are,

they require less hammering, they will run with less set, are less liable to get out of order, and they will yield and resume their place, whereas a thick one will not, but the surface on the plate will stretch more and will not contract again, and in such case the hammer will have to be used.

WHOSE MAKE ARE THE BEST SAWS.

I am often asked, who makes the best saws? I do not have any preference, they all make good ones and sometimes quite fail in making a perfect saw, and whoever gets a saw that does not work right, it is generally found to be the fault of the man that has the care of it. He does not know the remedy when the saw does not work right, and therefore good work is not the result, then the blame is laid upon the maker. It is a patent fact, saws do not work all alike, and there are so few men that become master of the saw and consequently hard to be found.

There is no saw but what can be made to

run good, yet there are many that will require much labor to get them in shape to do good work, and to make such saws work well, it requires a man well posted and familiar with them, and to get them in shape to give satisfaction. I do not claim to make every saw work equally as well, but with the following instructions if carried out, will enable most of the filers to become masters of the saw, so much so that there will not be one saw in ten condemned.

Many times saws get buckled by improper dress. Yet not enough to make the work very bad, but so much so that the saw cannot be trusted, and will not stand very heavy feed, but when filed nicely will make fair lumber on one or two inch less feed than other saws that are in the mill. But the swagers say the saw is worthless and cannot be made to run, and claim the maker is in the fault. Many times the saw will run all right half day or a week or month, but never if the saw is not right, as it will show its condition the first cut, but if it runs one day well and another day it may fail, the cause is from something that has happened to it, and the swager might think there was nothing unusual happened to the saw.

I find instances of the kind occurring with all brands of saws, and if your saw does not work satisfactorily, after examining the description here given you may be able to fit the saw so that you can make a success with it.

CARRIAGE AND TRACK.

I do not intend to say much about the mill or its machinery, but there are some things so closely connected with the running of the saw and that have more or less control over the same, I deem it essential to mention the most particular parts, such as the carriage and track. It is understood by most all that the carriage should be firm, and the bearings of the axels well fitted, so that there will be no vibration to the carriage, as otherwise it would make the saw to run bad and more liable to heat.

The track should be straight and of the right width, both of the wheels flanged and run on flat rails, as they are doing now in some mills, but

the old fashioned track in use in most of the mills, is, when straight and level, found to work very well, if the journals are nicely fitted and the collars kept set up closely to prevent the carriage from swaging or crowding up to the saw. Some times the track will appear level, but when you get a large log on the carriage and run over the track, it will sag or spring, and when the saw is in the cut, it has the tendancy to crowd the saw in the center and cause the mandrel and saw to heat. The heating of the saw will cause it to dish as it becomes warm. If the track is crooked side-ways, it will throw the log to and from the saw, thus making uneven lumber. The track may be all right and still the carriage will sway to and from the saw. This may be caused by the wheels not being true.

One cannot be too particular in fitting the wheels, they should be shrunk on the axel-trees and turned up to a perfect gauge. Many will turn up the wheel and then key it on axel, such wheels are not on true, and will cause the carriage to move to and from the saw. I have seen wheels of carriages that would vary or run out ¼ of an inch every revolution.

There are but few nicely fitted carriages, the truer and stiffer the carriages the better the lumber will be. If you have a poor carriage and track, the best saw that ever was would be spoiled in a short time.

Many times filers and sawyers will keep fooling with a saw, leading it first one way then another, trying to make the saw run straight; when if they understood how to test it, it would not take 10 minutes in so doing, and to ascertain whether the trouble was in the saw or the carriage or track.

It is very important the filer should be able to do that much if he could not repair it, after this fact has been learned the trouble is half over.

It is an easy matter to examine the saw with the right kind of tools to do it with; the track should be solid, level and straight, and the carriage firm and run free.

THE ARBOR.

The arbor is another appendage to the mill and united with the saw, so much that whatever effects one will effect the other.

Many mill-men are troubled with hot arbors which cause a great deal of delay and loss to the mill by heating the saw. This is from several causes, sometimes the arbor heats from the saw, crowding too heavy against the collars and some times the arbor is cut from the cap, being set too close ; more times the boxes are not filled with the right kind of metal.

A great many arbors are of iron and thus it is a very hard matter to make an iron arbor to run cool. Not one iron arbor is round and smooth, nor one iron bar in a hundred that can be made so, as all iron has hard and soft streaks, some more and some less. Iron bars cannot be turned true, and if they were finished true at first they would not remain so long, for where the soft streaks are that will give way before the hard portion does, and cause the bearings to become out of round and the arbor

to run unsteadily, thus causing the saw to run bad. No arbor should be made of iron, steel is much the best. If your arbor is of iron get steel boxes and fit them closely, and temper them to a good hard temper, the greater the contrast between the two metals the less friction ; some have steel arbors and they cannot help them from heating. By changing the metal in the bearing that may make a difference; by examining the arbor and getting at the hardness of the metal you could make up your mind whether it were softer or harder metal in the boxes that was needed. Many times the arbor is out of line which causes it to heat. Sometimes the back end of the arbor is forced out of level by the strain of the belt. This can be tested by placing a weight upon the tightener until it sags the same as when running ; then apply the level to the arbor and see if it is level when under the heaviest strain. All arbors should be leveled with the tightener and with as much strain as subjected to at any time, that will show whether the floor timbers are solid. If they spring they should be stiffened. Some times the front end of the arbor will lift when

in a heavy cut, try this by getting a pry upon the track and under the end of the arbor, try it to see if you throw the arbor out of level. You can judge something the amount of strain to apply upon the lever, that will depend upon the distance from the saw to the center of the pully. It is generally two-thirds the length of the arbor from saw to center of the pully, that will leave one-third the power that it takes to drive the saw to lift the front end of the arbor, and the strain down on the back end to pull it down. Many men will level up the saw arbor when it is laying light in its bearings, not even the heft of the belt upon it and think the arbor is level, but when the saw is in the cut and laboring heavily, the arbor may be out of place ¼ of an inch and this will cause the saw to run out.

When the floor springs there is no saw that will run straight, when the saw is running light, the arbor is nearly level, and when it strikes into the cut the front end will begin to lift, and then the saw will begin to run out, and the more of a cut the more it will get out of level, so much so the Sawyer thinks the saw is wrong, then he shifts the gear, and when the saw is in

a light cut and the guide holding the saw in it, will run in on such cuts, and if you ease off in the feed the saw will straighten up and get back into the log. And thus the trouble is laid to the saw, when in reality the trouble is in the foundation of the Mill.

I have found this difficulty to exist in many of the mills, and the filers dressing the saw to evercome the spring of the floor. If such men understood the saw they could tell by examining whether the trouble was to be imputed to the saw or some other part of the mill. I have given such points as are but seldom understood by Millrights in regard to the leveling of the arbor, "which should be adhered to strictly," in order to produce good lumber. The slightest difference in turning up the collars of the arbor, or in the finish of the saw near the hole, will cause a very perceptible difference in the hanging and of its true running.

In such cases many use packing between the collar and saw to true it up; the best way is to examine the saw first and if found to be true, then remove the lug pins and try the collars, should they be found full in spots they should be faced off, and to do that great care should be

taken in order to accomplish a nice Job, this can be done without removing the arbor from the bearings. The caps should be tightened so that there would be no chance for the arbor to lift up, the next thing is to place a smooth hard point against the center of the arbor and press against it to prevent the arbor from vibrating, or moving endways by the running off the belt: this should be well oiled to prevent it wearing, this point can be placed against either end, whichever may be the most convenient. It is less in the way on the back end.

The next thing is to take some heavy piece of iron, one that has a sharp corner and will lay close to the face of the collar, to form a rest for the tool while trimming, the closer the rest the easier it is to hold the scraper while turning off the face. The back or solid collar should be be hollowed out to within 5/8 of an inch of the outside, this edge can be scraped off where it is too full. Take an old file and grind the end nearly square and sharp on the edge, this will remove the full points. Many claim that the outside collar that comes in contact with the saw should be straight on its side ; such a collar is more beneficial when the taper ground saw

is used. The saw-makers recommend such collars, and to use packing to make the saws stand up straight. I prefer saws that will hang right in the collars without any packing. It does not take any longer to hang a saw right with the hammer, than it does with paper to true it up, when it is done with the hammer it it is right, but when it is trued up with paper it produces an unnatural strain upon the saw, and causes the saw to buckle with less strain upon it. Always do a thing the right way and it will be useful the longer.

I prefer both collars turned the same way with a face upon them 5/8 of an inch wide, they will hold a saw better than the straight full faced collar. After you have scraped off the back collar until it is perfectly true, the collar can be fastened up in the bearings better than it can be done in a lathe, and is far better to do it while the arbor is in its place. Many times collars are faced off in the lathe, and in so doing the collars are not perfect. Then, many times the work is done by persons that are not competent. It is a very nice piece of work to fit the collars as they should be, after you have taken all the end play out, the lug pins must

be removed, set the rest up the right heigth, or so that the cutting edge of the tool will come on a line with the center of the arbor, the tool used should have a sharp cutting edge, yet not too sharp, the best thing to use is a flat file, grind it smooth on one side, and square across the end or very nearly so, until you have a straight square edge; hold firmly upon the rest, and not allow it to tremble, and touch the face of the collar lightly until all the full spots have been removed off.

While doing this the arbor should be run very slow, and the face of the collar be perfectly flat or straight on the face 5/8 of an inch from the outside, the inside of the collar should be chambered out so that it will not rest upon the saw, but not too much. $^{1}/_{10}$ of an inch will be sufficient, if too deep the lugpins will not stand so well, and all that is removed weakens the collar and will get out of place quicker. When the back collar is fitted up true, the face or front collar should be tested with the straight edge, and if any imperfections are discernable they must be scraped off. Try the saw with a straight edge and if found imperfect, it should be straightened. See instructions for straightening.

After the saw is straight, place it upon the arbor and tighten up the collars lightly before the lug-pins are put in, do not set the nut too tight, leave it loose enough to admit of turning the saw between the collars, the outside collar should not turn; turn the saw one revolution and if any imperfection in the saw or collars it will show it. If it is in the saw, the collars will be marked all the way around, and the saw will show where it is worn, the lump or bulge on the same can be taken out with the hammer, but if the mark should be on the saw all the way around, then the full spot is in the collars, and can be scraped with the tool you have used, until you have a perfect fit and cannot perceive in the wear any difference either in saw or arbor, and they show the same surface, then replace the pins but do not drive them with a hammer, they should be so nicely fitted that they can be removed with the fingers, but at the same time there should be no shake or bur upon the pin or by side of the hole.

When there is a bur upon the pin or collar it causes the saw to run bad, and any uneaven press upon the saw will cause it to buckle, after the pins are in place, hang the saw and screw

up the nut firmly, then turn the saw slowly holding a piece of chalk, on the side to see if it runs true, if it should not, the chalk will show the full spots and can be straightened. See page 98 Should the saw run perfectly true it is all right. Untrue collars will cause the saw to rattle and waver in the cut.

The instructions I have given will enable any Mechanic to fit the saw and collars more perfect than ¾ of those now in use. Do not attempt to do this work unless you fully understand the instruction here given, and that you are Mechanic enough to do the work as it should be. You had better spend a whole day in doing the work right, than to allow it to go half done.

After you get the saw and carriage to run true, then it will be best to try the range of the arbor, the best way is to slack the guides, letting the saw remain free, then move the carriage up until the head block is on a line with the front edge of the saw, then take a file the shank dressed to a point and lay it upon the head-block, and place the point of the shank lightly against the saw, then shove the carriage back until the point is opposite with the back edge, the point should clear the saw $\frac{1}{32}$ of an inch,

that is as much range as is necessary or good for a saw.

After trying the saw one way, turn the same ¼ of the way around and see if there are any imperfections in the saw, if so it will show them.

It would be better to try the saw from the four quarters, then there would not be any mistake and will leave the arbor in perfect shape.

FILE ROOM, AND IMPLEMENTS NECESSARY TO MAKE THE BEST RUNNING SAWS.

The file room as a general thing is the most neglected part of the mill, and many have no room at all, and hang the saw upon anything where they can have a chance to use the file, as some have a temporary bench or post, no one can file a saw true with such appliances, then when the saw is brought into use wonder why it does not run better. Three-fourths of the filers will say that no saw can be made to stand 8 or 10 inches of feed. If the saw is filed right and is straight and true it can do double the work that it could if it were not so.

If mill-men can make a gain of 10 per cent. above what they are now doing, it will be sufficient to pay all expenses.

In filing saws it is necessary to have a good light room to work in, with plenty of room to get around, and should be furnisned with the best machinery and the most improved tools to work with.

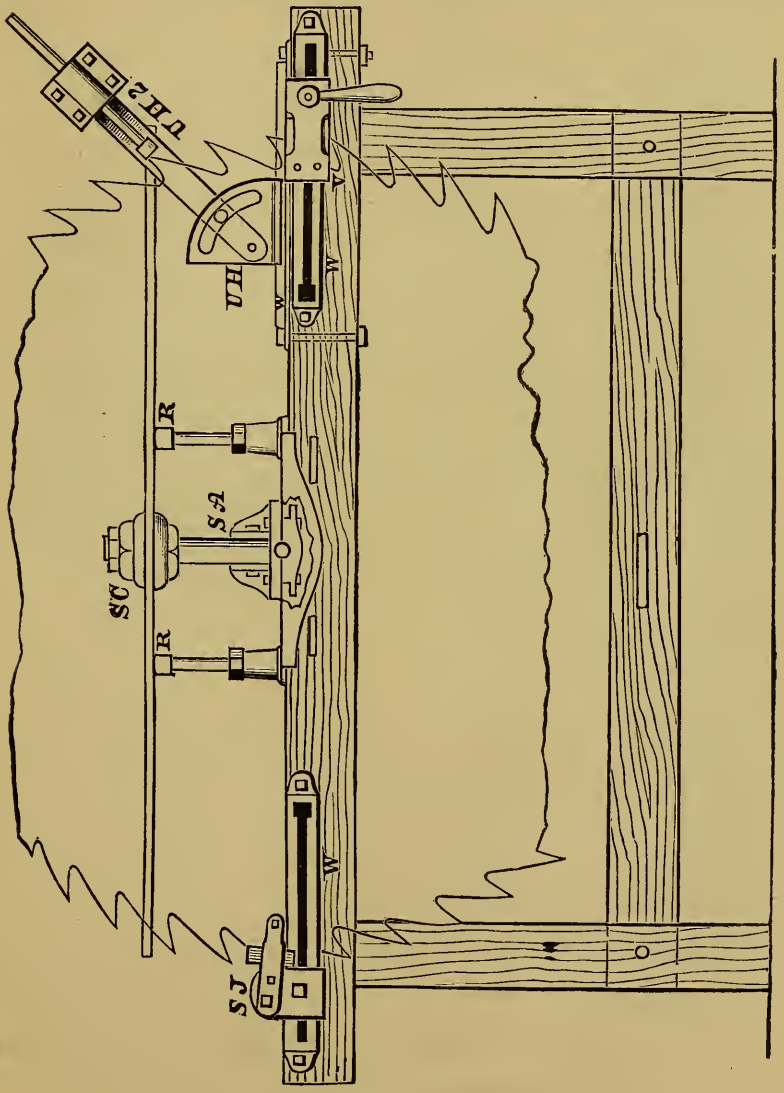
I find, where mills are furnished with such they can make the best lumber in quality, and the most in quantity. I do not ask men how much lumber they cut, I can tell that by what their yards will show, and whether there are any defects in the saw, and if so, wherein the man that has the care of them is in the fault. Many times the saw makes bad lumber for want of suitable tools to work with, when virtually it is not so much the fault of the filer. Every file room should have the best emery wheel rig and a good solid bench, with a full out-fit of hammers and straight edges with anvil to use when needed. I have for a long time seen the imperative need of these tools, but they would be of no need to those who did not know their use or how to use them. And with instructions given here, any man that cannot learn to

use them ought not to have any business in the mills, they take the place of good men at an expense of $5 to $10 per day, and are the very poorest acquisition to the file room.

I have endeavored to get up the most improved tools for file rooms that have ever been used. My automatic saw-sharpener is the best and most complete machine that has ever been placed in a mill, and if handled as is designed they should be, they will do the greatest variety of work, and the most perfect of any machine now in use. It fits the saw ready to be placed upon the arbor without the file, and will have a better edge than can be put on with a file ; the teeth will be all of one shape, and the saw perfectly round, and the teeth are always gummed ready for use and in perfect balance. The above I claim to be points ahead of any other method used in the past by any one.

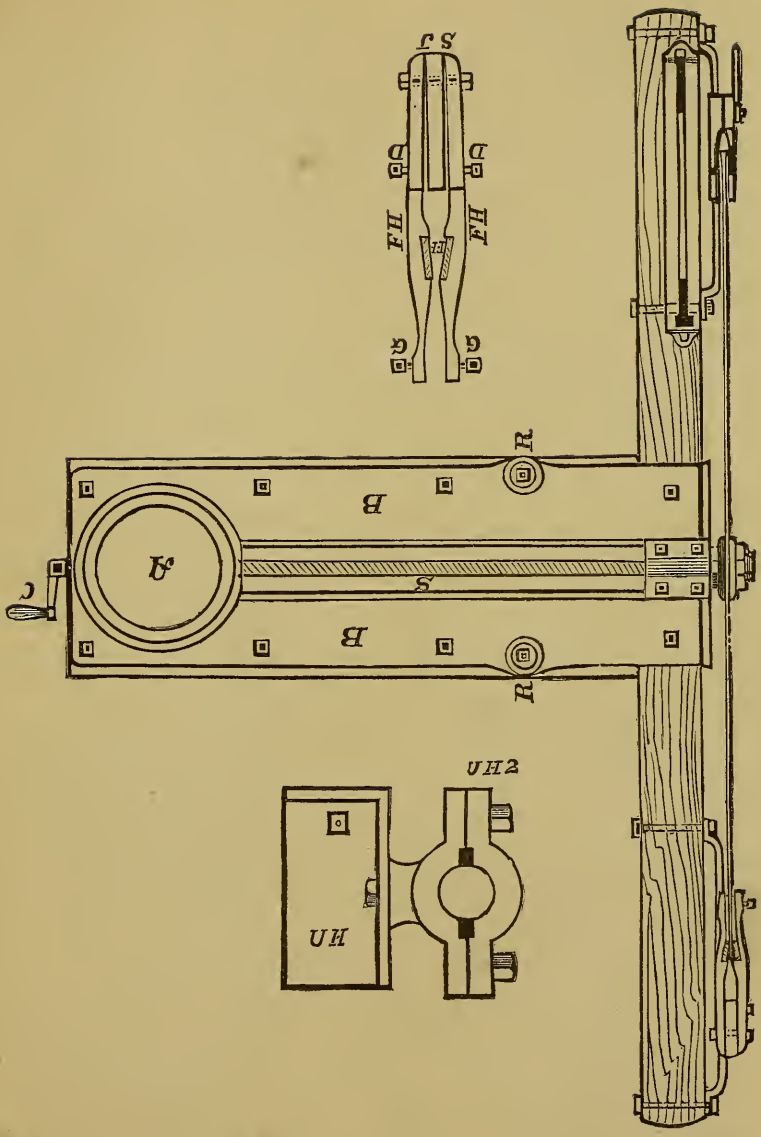
I have a bench for swaging, setting or filing the saw upon, it is differently constructed from anything that has heretofore been used, and the design is to combine such tools as are needed to keep the saw in perfect shape or as near as they can be with

THE MOST COMPLETE SAW BENCH EVER USED, SHOWN BY THE FOLLOWING CUTS.



CUT NO. 3.

Cut No. 3 is a front view of this bench with the saw arbor S A turned up as it stands when the saw is horizontal and shows the collars S C for clamping the saw, these collars are independent from the arbor and so arranged that the saw can be clamped between them and firmly screwed up, will admit of removing the saw and collars from mandrel, and the saw can be turned around without slacking them. This enables one to test the saw and hammer it on either side with the collars on. The arbor S. A. is hinged to a slide which is adjustable, W W W is three ways for the purpose of adjusting the several attachments to, U H is an upset slide so constructed the upset can be held at any angle to suit the pitch of the tooth, U H 2 is the upset-holder provided with a round boring with a slot on each side, the shank of the upset is furnished with a lug, this can be changed half way around and hold the upset in such a way that either side will come in contact with the point of the tooth alike, this will prevent the changing of point of tooth, and hold the upset alike on every tooth as shown by saw tooth here represented. V is a vice for clamping the saw while swedging which is adjustable to the size



CUT NO. 4.

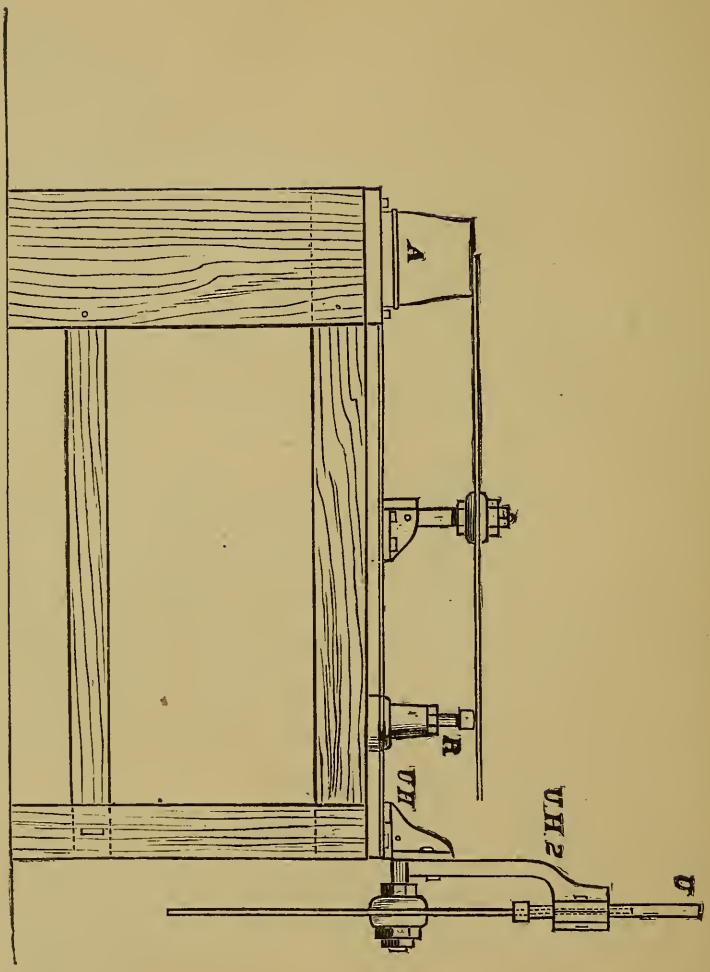
of any saw, this slides upon one of the ways. S J is a side jointer for the purpose of gauging the teeth to a defined width which is not done on an average, this is shown in the position as used on the saw. R R are rests for holding the saw level while hammering. Cut No 4 is a top view showing the arbor S A turned down with the saw hung upon it. V is a top view of the vice, showing the manner of clamping the saw, in same view is a top view of side jointer and gauge S J, F H are the file-holders showing the position of the files F F, D D are set crews to keep the files the desired distance apart to regulate the set. G G represent set screws to guide or hold the saw steady while turning, by slacking the thumb nut this will allow the file holders to be turned back, out of the way, and when using are applied to the saw as shown, by revolving the saw slowly between the files will dress the sides of the teeth more accurate than any other gauge or jointer. U H is a top view of upset stand. U H 2 is the holder showing the slots for the purpose of guiding the upset, and when it is brought in contact with the teeth it is held plumb over the tooth, and perfectly square with it. A is the anvil,

B B is bed for arbor to slide upon. C is a crank that turns screw S, for the purpose of moving slide carrying the arbor for to bring the saw in the right position upon anvil, Cut No. 5 is a side view, this shows the saw in both positions, perpendicular and horizontal, it also shows the upset holder in line with the saw, and also resting upon anvil A and rests R R. This is more clearly shown in this way represented, and the benefits of the bench by the instructions given.

I do not think it will be very troublesome for a new beginner to operate successfully upon.

The anvil sets in a socket on the bed-plate and can be removed when not in use to prevent the face from getting marred or defaced, as the smoother and nicer it is kept the better the saw will look and be when done.

In regard to the frame or wood-work for this bench by examining the above cut it will be seen, any Carpenter can frame it together, and as it will be about as cheap to make the frame in the mill, I will furnish the iron work, ready to be placed upon it, and this will allow the making of frame suitable size for the saws used; the anvil rests upon a block 10x14; the



CUT NO. 5.

rest of the frame is 4x4, and makes a good strong bench, and that will enable any one to accomplish more work on this than any other

bench in use, than he can with some one to help him on the ordinary anvil and bench.

HAMMERING OF SAWS.

In hammering, I shall introduce a new mode of operating than that of the usual way. Nearly all hammer-work from the center in straight line to the rim, the result of such a process is attended with more labor, as the slightest difference in the blows upon the saw will produce an open and tight line running from center to the edge, the effect upon the saw will be a rattling or trembling motion which causes the saw to run unsteady.

If there is an open line running from center to edge, this line runs across the line of motion of the saw and the right way to cause the saw to buckle, as all buckles run from center to the edge. If the saw is hammered in circular lines around the plate, there will not be any ridges or buckles formed in the saw, but if there should be any one line expanded more than

another, it will not effect the running of the saw as it would if it run from center to rim.

The principal feature of this bench will be readily understood by observing that the saw is held by its center, and held level by the adjustable rest R, causing the saw to rest level upon the anvil; the saw can be revolved around and the blows applied more uniform in rate, and the position of the body remains unchanged, far more so, than when working from center to rim, the body changes position with every blow and this will cause the blows to vary both in weight and distance apart.

The most difficult for new beginners, to apply the blows at equal distances apart with uniform weight; the operator should take such a position that the blows would all be delivered in a line without necessitating a change in position; it is almost an impossibility to change position of body without its changing more or less the force of the blow, therefore the more uniform they are the better the saw will run, and the less work to have the saw right. A new beginner, by keeping these facts in view will enable him to be more successful. Some times it is necessary to deliver a heavier blow

on some parts than upon others, as the case may demand, the higher the spot or defect, the heavier should be the blow. Each blow delivered should be marked off at a uniform distance apart. In laying out the saw by the diagram as shown, it can be done more accurate than hammering the saw without doing so, where each is laid out it can be done on both sides so that the blows will be delivered exactly opposite each other. In opening the saw where the blows are delivered promiscuously or without laying them out, they are never uniformly opposite each other and therefore the work imperfect, and will require more time to level up or straighten the saw. After you have it opened sufficient, it is always necessary to test the plate and ascertain if the tension is uniform and equal; some times after the saw has been opened, so as to appear right and the hard spots are taken out, the saw will be found too open; one should work with great care and precision to have it right. When that is adhered to and followed out the saw will be perfect in all respects.

The more imperfect a saw runs the more power it takes to drive it, and the greater the

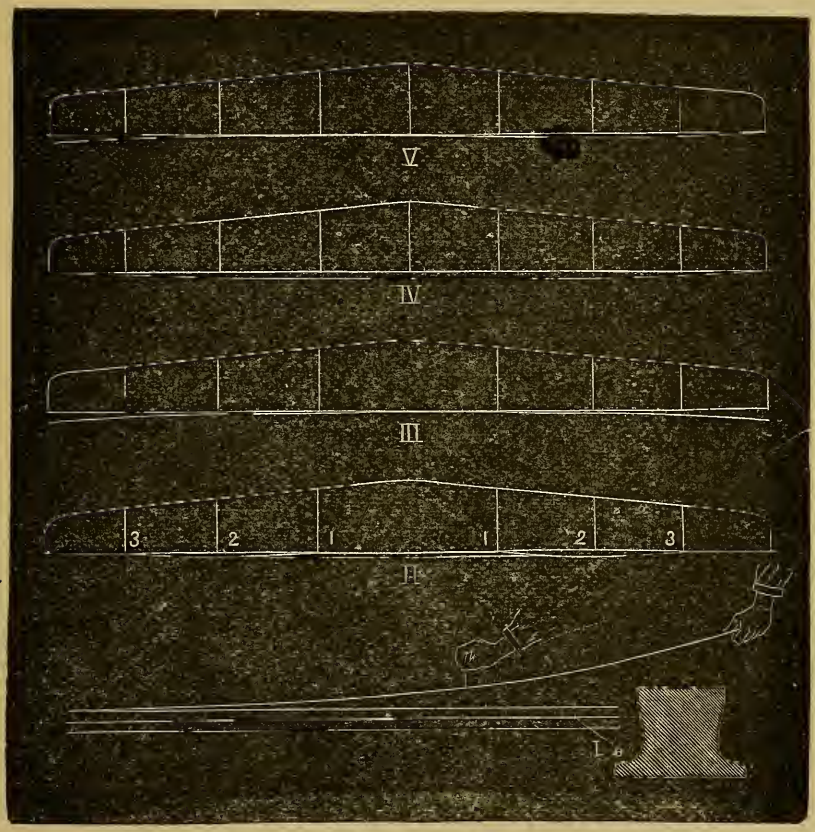
loss in stock, wear and tear of machinery, and less can be accomplished.

I have endeavored to set forth the importance of having the saw right, and will now give such instructions as will enable unskilled men to keep their saws in far better shape. It ought not to be expected that a new beginner in hammering saws cause them to do as well as they are likely to do after they may have had some experience and practice, but will be of benefit from the first.

The first step in order to make a success is to have a thorough knowledge of the tools and how to use them; and will commence with

THE STRAIGHT-EDGE AND ITS USE.

They should be of steel, and four of them of different lengths, as follows: No. 1 should be 4 feet in length with a V shaped edge and perfectly straight; most every one uses them with a square edge, and hold it at an angle on the saw to admit of light under it, to ascertain where the defect may be; the straight-edge should have such an edge that it will



CUT NO. 6.

show the defect in the saw when held at an angle with the side of the saw, it will not detect the imperfection so readily as when at right angle, Plate No. 6 shows the long straight-edge applied to the saw, and how the saws will appear under different aspects when applied, as in figure 1. This plate represents the saw resting upon one edge and held

by hand raised clear from the anvil, the heft of the saw will cause it to spring as is shown, the straight-edge should be applied to it as represented across the middle and at right angle to the position in which it rests, this is the way to examine and ascertain the condition in which it is in.

The straight-edge should reach not less than ¾ the distance across the saw in order to more fully show the conditon.

Many claim it not essential in having a straight-edge to reach over one-half the distance across the saw, but no one can detect the defects so readily with a short one as can be done with one reaching clear across, as when applied it will show the slightest defect if any, as shown by figure 11. This shows the straight-edge extending across the saw and divided into 4 equal parts from the center, each space is numbered for reference hereafter.

The curved line on the underside shows the saw as it will appear when opened right for a speed of 10,000 Periphery feet per minute when applied as represented below.

The saw should not drop away from the straight-edge between lines 1 and 1, this re-

presents one-fourth the size of the saw, this part of the saw should be left as stiff as it can be made, and there should be no hammering between the two lines mentioned.

Between 1 and 3 the saw should be hammered open as much as it will bear and not dish either way, when the saw is hung perpendicular upon the arbor it should appear straight every way, but when resting upon the opposite sides, the application of the straight-edge should be had. If the saw is of medium hardness and but its own weight to sag it down, the center should not drop to exceed 1/8 of an inch from the center of the straight-edge between lines 1 and 1 or across the center of the saw, this much should appear straight and not on a true curve as shown by figure IV of the same cut.

The saw when hammered open in the right place, that is between 1 and 3, which is the first part of the saw where the hammering should be done, to produce the best running saws, for the following reasons. First, that portion of the saw should be so open that the expansion of the rim will not make it so long as to cause the saw to buckle or shake as it will when too tight, the saw from 2 to 3 should be opened sufficient to

admit of the expansion of the rim while running without affecting the center. Second, when the center is tight or stiff, it acts the same as a large collar to support the saw without an addition in thickness of the saw, the center does not expand while running unless it should heat by the arbor becoming heated, or heating from any cause it will expand, and if it has been hammered down to the collar as many do, the heating will expand the saw so much in the center that it will cause it to dish and throw it out of the log, necessiating the moving of the guides to hold it in the cut. In running a saw that is too open in the center between the two lines 1 and 1, it will make it necessary to shift the guide often, first one way then another, as many Sawyers have had such experience and did not know the true cause of the trouble, the more open the saw the more thick and thin lumber will be made, the above defects exist more or less in one-half the saws in use, caused by too much hammering inside of one-fourth the size of the saw. It would be far better for new beginners to go slow at first, and not get them quite up to the point I recommend, nor until you have tried them, it will be better to have them a little tight than too loose,

if the saw is too tight it will make snaky lumber until it gets warm, then it will run good until it cools off and then it will be best to repeat the hammering until it runs right, should you do too much to it it would be necessary to stiffen it up, by opening between 3 and the edge. One should work with care, some saws will drop away more than others from the straight edge, and in regard to this point will differ fully as much again with some saws and both run all right. The cause of this is in the temper of the saw, a hard, firm saw will not expand so much with the same speed as a soft tempered one will and therefore will not drop so far by its own weight.

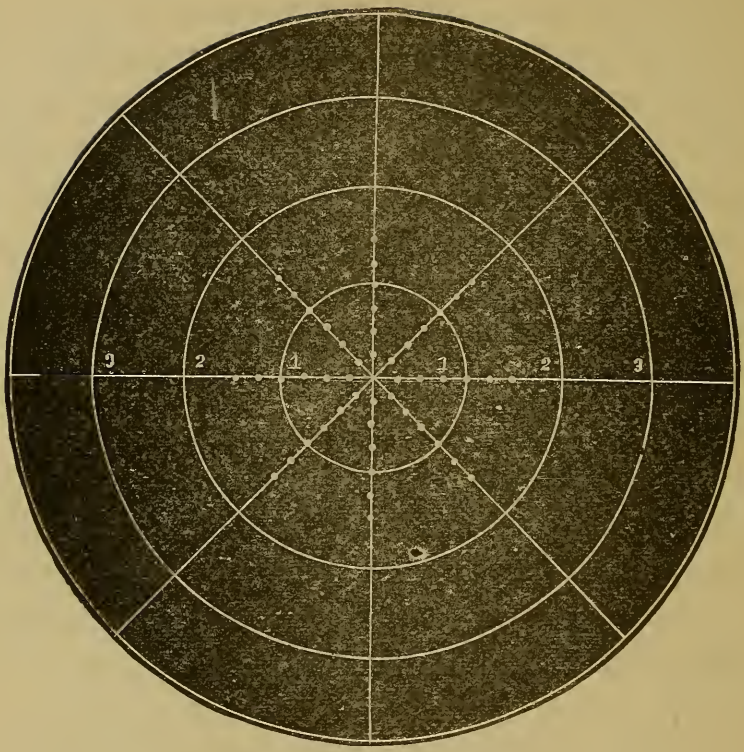
To judge more closely when the saw is open sufficient, allow it to stand upon its edge, balance it nicely between the fingers, then give it a sudden shake, if the vibration extends out beyond the 3rd line and is true, and vibration long, this will indicate it has about the right opening, but if it is too tight it will become stationary at once. If too open there will be a snap or jerk to the vibration, and will come to a rest as quick as though not open enough. These things should be closely observed.

Figure III represents a Saw that is too stiff or open in the center, and this is the way the saw will appear when tested as shown at the bottom of this cut, such a saw will make very snaky or winding lumber and will not run until warmed in the center. Saws get in this condition by becoming heated on the rim, sometimes by holding the saw too heavy with the guide, and more times from heating the edge while gumming. Whenever steel is het it expands and does not fully return to its former position, and this is the principal cause of saws getting out of order and to require hammering so often.

A great many mill-men do not understand this, they send the saw to the shop to be hammered, and when returned will not run well for a few days and is considered as bad as ever, then the fault is thrown upon the hammerer, when, if the truth was known it would rest on the filer or sawyer, from some cause the saw had been heated up and gotten out of shape again. No. IV represents the saw that is too open in the center, and what is called a dished saw, and should be opened on the rim. No. V in cut No. 6 represents a twisted saw

frequently found, but not so often as the other, all of these defects are found by examining with a long straight-edge ; this is what I use it for, and to ascertain the imperfections far better than with a short one, as many use those of but two feet in length, and some even shorter, and claim it to be all that is necessary. It may do for those who have had much experience but no one can do as well with the short as with the long one in getting the saw just right. I have hammered a great many saws with nothing but a steel square to use ; a short one is handy in taking out the lumps and in leveling up the saw. I shall refer many times in what may follow regarding the instructions above given.

When testing to ascertain if the saw has the right opening the long straight-edge should be used, when straightening saws a short one is better, and to be used in detecting the lumps or loose spots, this is done when the saw is in a perpendicular or horizontal position. It is necessary to try the saw both ways, which will be more fully explained in this as occasion may require.



CUT NO. 7.

LAYING OUT SAWS FOR HAMMERING.

Plate No 7 represents a saw spaced off and the circular lines laid out and numbered to correspond with the numbers on the straight-

edges; the saw has a division of four equal parts from the center as is shown by circular lines; these lines should be drawn upon every saw to be hammered, and if the instructions are followed you may at times have occasion to refer to the lines and numbers.

This plate also represents a saw that has been sprung or dished close to the collars, in order to remedy this state of the saw, the first thing necessary will be to lay out where the blows from the hammer should be first given to bring the saw back to its proper place. The lines running across the center of the saw should be evenly spaced. In laying out the saw use hard soap or tallow to mark the saw, it being preferable to chalk and leaving a plainer mark. Divide the saw into 8 equal parts, as shown in this plate by the straight lines, this is easily done by counting the teeth, the diameter should be divided in 8 equal parts, as shown by the circular lines, which can be done with a cord, or if you use my bench, I have a straight-edge fitted for this business, you can hold the soap or tallow against this and turn the saw, producing a true circle. After you have these

lines laid out, then mark where the blows are to be struck represented by the dots in the cut, lay them out at equal distance apart, upon one line the full side of the saw, always using the hammer upon the high or full sides, when straightening, strike a circle from each dot around the center as more clearly shown on cut II, this is far easier than to space off each line, strike the blow upon saw just where these lines cross, this should be done whenever you wish to open the saw, and should be laid out upon both sides with each line opposite each other, so that you can deliver the blows opposite to each other and the nearer perfect this is done, the less labor it will be to level up the saw. After you have used the hammer upon both sides and the saw has not been left open enough, divide the spaces equal and lay out the saw as before, but between the lines worked on before. It may not take as many blows upon each line as has been given to produce the desired result. You can lay out just half of the number as before, always doing the same amount of work upon each side when opening the saw, unless the saw should be dished, then it would be better to straighten by using the hammer upon

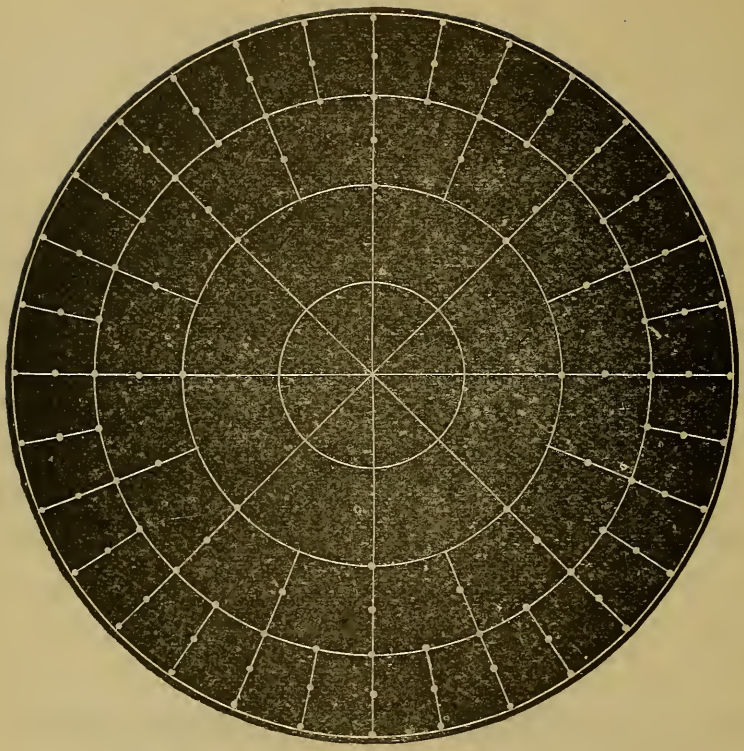
the full side until the saw is straight, after you have accomplished that, then use the long straight edge to test the strain as shown in Cut No. 6 to see if it is open sufficient.

The instructions I shall give can be followed with more accuracy upon my bench, and with the different appliances attached, will enable a new beginner to accomplish more with less labor than can be done on any anvil or rig that is now in use, and would be far better for any one that wishes to take the advantages this conveys and to have the best tools to work with.

STRAIGHTENING A DISHED SAW.

Plate No. 8 represents a saw that is dished or sprung close to the collars as will appear when tested with the straight-edge, and shown by No. III in plate 6 on one side, and like No. IV on the other side.

This saw may be open sufficient when it is straightened up, to do that without opening or expanding the center, it would be necessary to



CUT NO. 8.

proceed in the following manner. Lay out the saw as shown in this plate upon the full side, in straightening do not use the plain face of anvil as it should be padded; this pad can be made of wide belting free from rivets or uneaven spots, leather or rubber; old leather is preferable, cut it in shape of the top of the anvil with a narrow strip left on each side to turn down,

make a band to fit loosely around the anvil, and turn the narrow strips of the pad down the sides, and drop the band down over them, this will keep the pad in place while in use and can be removed when desired. This should always be used when straightening or truing up the saw, and where tight spots appear, so the saw requires expanding or opening, it must be done on the bare anvil with a hammer. If you have not an anvil a hard wood block set upon its end will serve the purpose of the padded anvil to straighten the saw, but not to expand or open it, and you must have suitable straight-edges and hammer. Some recommend a hammer weighing 3 or 4 pounds, but I would prefer one but 2 pounds for a new beginner, as he could handle it better and with more success at first than one heavier. The face of the hammer should be slightly oval or full, not too much so, neither too flat, such ones as I send with the bench will be of the right shape and as handy for new beginners as any now in use. The inside circle represents ¼ the diameter of the saw, and should not be expanded or opened inside with the hammer, as saws generally get opened enough by being sprung or dished by heating. No saw

can be dished without the center being expanded so much that it will be too open; all saws are liable to the above difficulty, that is the reason why the center should not be opened inside of one-fourth the size of the saw, inside of the circle is where the whole difficulty lays in saws getting sprung, and this part should be as stiff as they can be made, this will help support the saw in its labor, and is a point new to many saw-makers as well as Mill-Men. As I have before stated, in hammering the usual way, many hammer from center out, commencing just outside of the collar; this brings the blows closer together near the center, therefore weakening the saw just at the place where it should be the strongest. I used to do the same thing until experience taught me better. The center should be as tight as possible; when cold, be gradually opened out to line No. 2, from there to No. 3 it should gradually diminish again, until near one-eighth of the size of the saw and the rim made tight, this is a part of the saw affected by the momentum.

By opening the saw from line No. 1 to No. 3, it will allow the rim to expand while running, and not become looser than from 3 to 1 as this part never expands by the running and seldom

by heating, this is the reason why it requires to be opened with the hammer.

I have endeavored to point out these things so they can be clearly understood and what can be accomplished if followed out.

In straightening a saw the straight-edge should be applied very often to detect any change that may have been made. The straight-edge to be used in straightening the saw, should be from 18 to 20 inches in length, this is the most convenient for that purpose. When using it the saw should be hung up plumb, the usual way is to stand it upon its edge and holding it plumb, this requires a helper, and that is generally one that knows nothing about hammering saws, and will allow the saw to incline slightly, this will effect the condition so much that it will not show the defects. When a saw is standing upon the floor it is not in its natural position, and will not appear as it does when hung from the center, that is the way in which it labors and should be held in the collars as when hung upon the arbor, some saws will appear all right, so much so that one cannot detect any defect in it while standing on its edge, but when hung upon the arbor and the collars

screwed up, it will be very much out of shape. These things are seldom noticed or any attention paid to them.

These small defects are more apt to increase in size than diminish. As near perfection as possible is the object sought for in the care of saws, and one should not get discouraged when reviewing this subject and its instructions, and think that they are not competent to undertake such a particular piece of work.

The improved bench and attachments I have gotten up are to assist the filer in becoming proficient in his sphere of business.

I have heretofore mentioned relative of the dished saw or one too open, the result of such is it will heat in the center, and thus causing it to become more dished by the expansion, and such saw must be held in the log with the guide, and will as heretofore remarked make thick and thin boards, some saws not so much so as others, and requires a high rate of speed to straighten them up so as to do passable work, then when the motion slackens the saw will lop out or in, just as the guide holds it.

TO HAMMER SAW THAT IS TOO OPEN IN CENTER.

Cut No. 8 represents such a saw shown by No. IV in plate No. 6, such saws should be laid out as represented in plate No. 8, these lines are the same as in No. 7, the dotted lines extend from No. 2 circle to the edge of the saw, and some from No. 3. Should the saw require but little opening one must be governed by the condition. It is not always necessary to lay out quite so many lines the first time around, if you hammer on 16 lines that may be sufficient, or 8 may do, others may require 32 and some 64, and it is best that one use his own judgment in regard to this matter acording to the condition of the saw. One should be very particular in laying out the lines and blows to be given, so as to have then exactly opposite, and if you work around the saw by commencing at the outside edge, turning the saw backwards from its usual course and always marking the line started upon, as there should not be more than one blow in a place, if so, it will leave a full place

or ridge upon the saw, and this will produce what some call a rattling saw, such saws are not true, it would be best to go around the saw about five times, and strike upon the dotted line, then turn the saw over and do the same on that side, after this is done, try it with a long straight-edge to see what changes have been made, and repeat this operation until the saw is in the right condition, as will appear in plate 6 No. 2. It would be well enough to try the saw in the cut when you get it somewhere near right, by doing this you will gain a better idea of the results of work done, and each time the saw comes off the arbor give it a few more blows with the hammer.

This mode of operation will enable, a new beginner to closely watch the results of his past labor, and get better ideas than to be governed fully by the instructions, and will give him practice as well as theory.

CUT NO. 9.

A BURNT SAW.

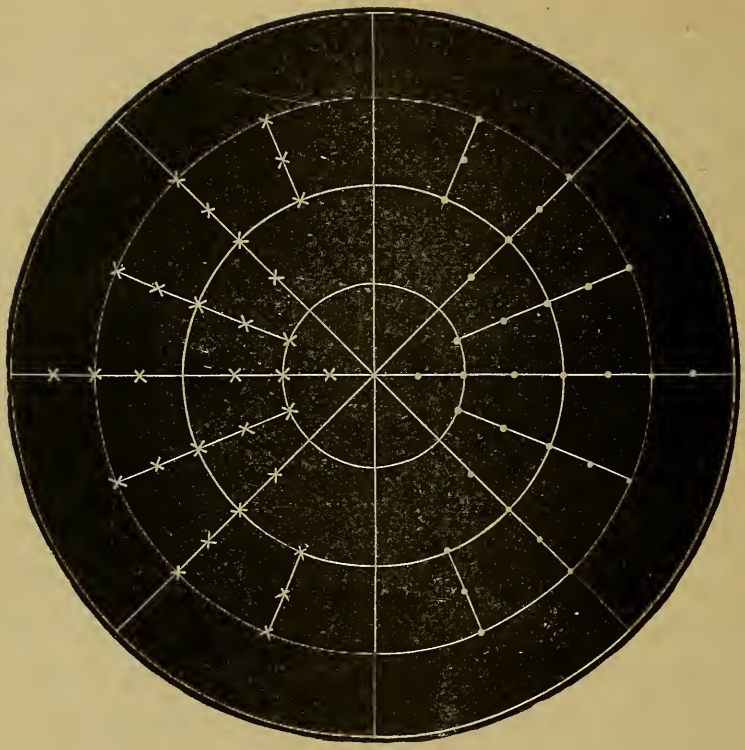
Plate No. 9 illustrates a burnt saw with different size spots, and showing the different methods to pursue with them, and generally occur upon the saw as represented, frequently they will be all of the same size.

No saw will become burnt when it is all right, saws generally get too tight before they get burnt, such results are caused by too great force and from the heavy pressure upon it produces a buckle. Thes spots become hot and expand, the steel will not contract again to its original place, the small spots can be taken out by using the hammer as shown by the dots with the pad upon the anvil. The number of blows I have represented to be given may not be enough, or may take more or less, this is to give an idea how to go to work at first, but the next size spots will require a different procedure, this is expanded too much to admit of all the steel being forced back to its original place, the edge of the saw must be expanded until the surface will be level or true, here are dots and crosses represented on these lines, the dots are upon the full side and more of them than the crosses, they represent where the saw is to be hammered upon the opposite side, but the blows should be as uniform apart as is possible. It may require a number of them more or less until the saw becomes straight, when that is done test it with the long straight-edge as before, and finish up by opening the saw to the

proper strain, after you have got the spots out or nearly so, you can examine it with the long straight-edge, and will often appear like No. V, in cut 6, this represents

A TWISTED SAW.

Plate No. 10 shows the saw in that condition and also how to lay it out for hammering. The dots show where to hit it on the face, the crosses represent the same number of blows to be struck on the opposite side. In straightening this saw the blows are delivered upon the full side, and with the pad upon the anvil. Saws in this condition may have originated from two causes; first, from being cramped and sprung; second, it will become this way if it is too open on the edge and in the center, and too tight between circle one and three, this will cause it to appear winding, when testing such saws the full spots will become slack, by springing the saw they will change from one side to the other in some cases. While testing a saw



CUT NO. 10.

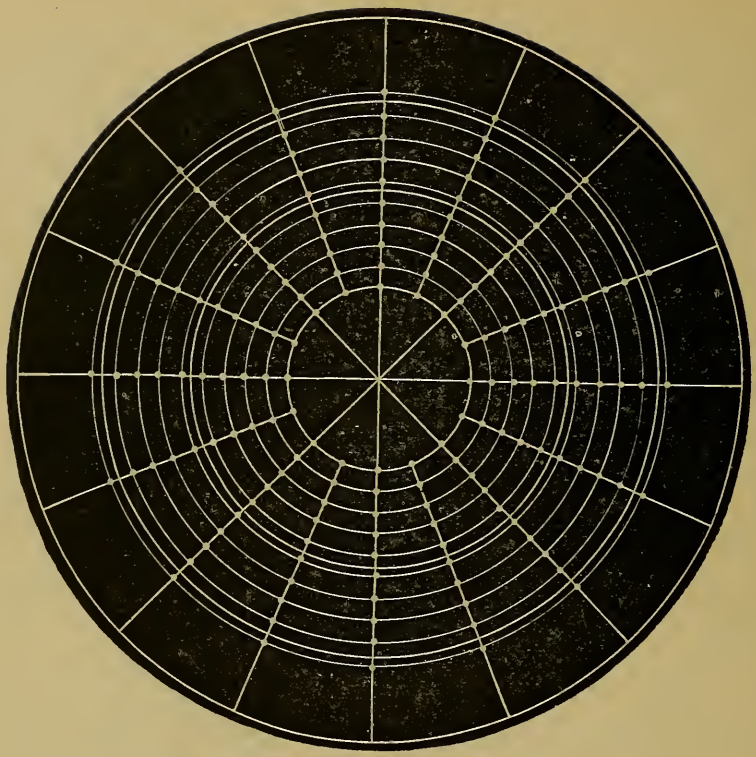
it is very important to notice how such saws appear, and whether the cause is by the saw being too open on the edge, or by its being bent or sprung. A saw that is bent or sprung should be treated as has been heretofore stated and illustrated in Plate 10. If too long on the edge remove pad from anvil and hammer the saw as shown here, not clear around, but half way as shown by the dots, then turn the saw

over and hammer as shown by the crosses, if this does not relieve or straighten it, hammer on the opposite side, this will expand the saw where it is too tight, also make the saw full stiff after getting it as straight and true as possible.

SAW THAT IS TOO STIFF

Is shown by Plate No. 11, with the saw laid out preparatory for hammering. This represents both sides of saw when it is straight and true, but is too tight.

This saw would make snaky lumber or run out and in, and is divided into 10 equal parts and 10 blows for each line; in laying out this saw it will be less labor to strike 10 circular lines around it as shown in cut and hit the saw on the cross lines, should this not open it sufficient, divide each space by striking a line from 2 to 3 across the circular lines already made, and go around the saw again on both sides, if this does not open it enough, wipe off all the old marks and commence anew, lay out as before only between the former lines and just



CUT NO. 11.

where it is not loose enough, lay it off and hammer open again or repeat this until it is opened enough. It would be better to test the saw with the short straight-edge and long one to see if it be true and level, as the case may demand. If this is done along as you open it, you will find it to come out near right, should you go on and open the saw until it appears

right, and then go to work to level it up or to take the lumps out, it might be too open when done. The best course is to open up the saw as represented, and then to straighten or level up.

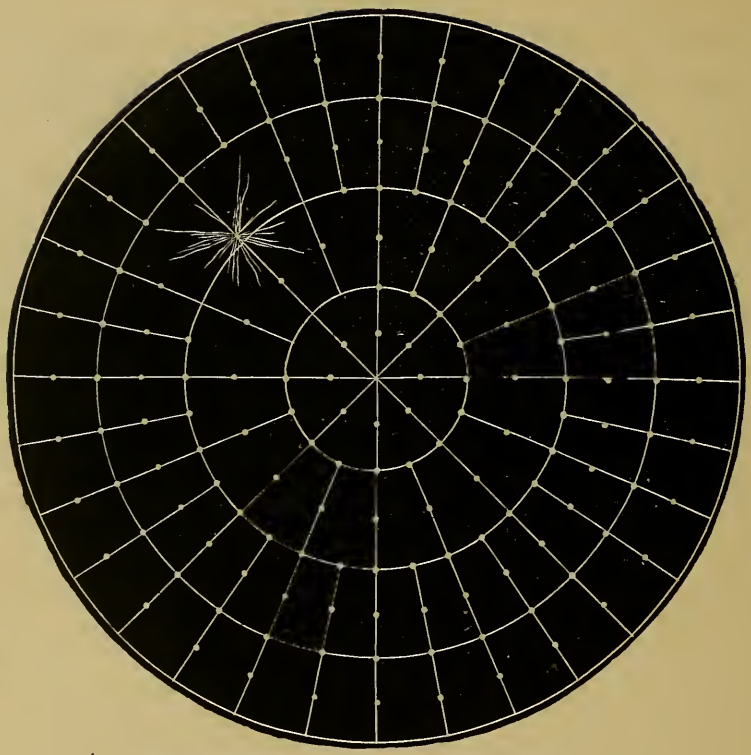
It is necessary to use the long straight-edge and then the short one, first one then the other, first in one condition, second in the other, which will be more fully explained in subsequent instructions.

After you have the saw very nearly perfect and you come to give it a thorough test, it may appear as represented.

A LOOSE SPOT.

The annexed plate No. 12 represents a saw that is nearly perfect; it has one loose spot.

There is not one saw in fifty as perfect as this one, and not one man in a hundred but what would make the saw worse than it is, if they were to undertake the removal of the defect. This spot is detected by the surface dropping away from the straight-edge in testing



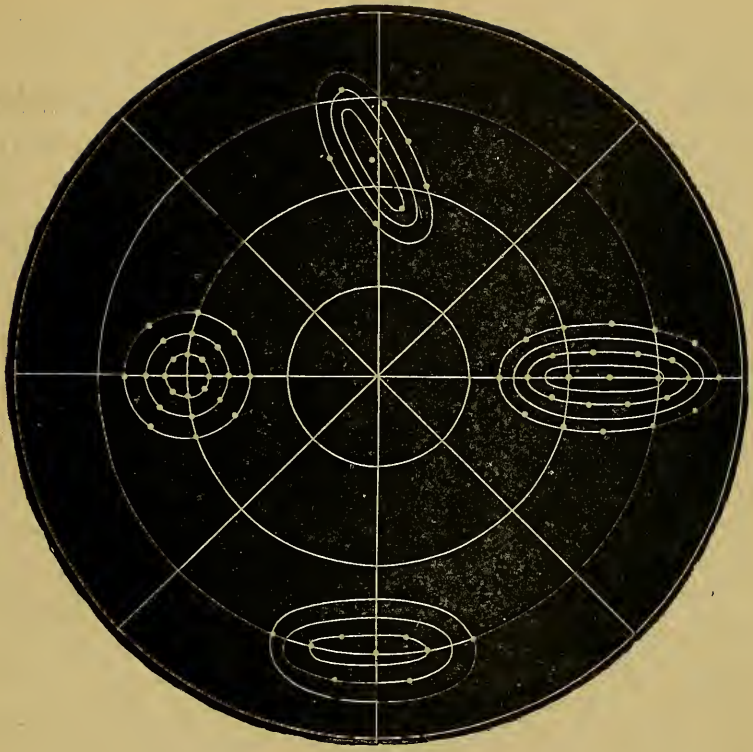
CUT NO. 12.

it, by allowing the saw to rest upon its edge and holding one side in the hand as is shown by plate No. 6. This spot will commence dropping away nearly out to the dots as represented. Many times a saw will show such a spot on the side, but when turned over and the straight-edge applied it will appear full on that spot or lump and require two or three blows upon the

full side with the hammer, but should the saw have the same appearance upon both sides and it drops away, the indication is that the steel has become expanded too much. The above plate shows how to lay out the saw ready for hammering.

This represents both sides and requires much labor to remove the defects. It is seldom you find so perfect a saw as this, and requires much care in laying out and hammering. If you better this saw it will run better than the average, and if you get them as near perfect as this, it will be safe enough to run them; as a general thing you will find three such spots in saws, if so, lay out as this represents. In marking a loose spot, mark it with cross-lines running as far as it drops away from the straight-edge and as many spots as you may find. In examining saws to find tight and loose spots, allow the saw to rest upon its center and spring the saw up and down, in doing so, the tight places will rise up to the straight-edge, and when it is changed to the edge first by bearing down, then raise it up. When raising up the edge the tight spots will drop away first, and when

changing to bearing down, the places will touch the straight-edge first, and drop first; and this spot will appear upon both sides alike. This is the course to pursue in testing to ascertain if the saw is leveled up properly. In finishing up, this is the process to go through with in order to get the saw right. These spots will not show when it is standing upon its edge, nor when hanging plumb upon the arbor, lumps can be found when hung up plumb, but when testing the saw to find the tight and loose spots, it should lay horizontal, resting in such a way the plate can be worked up and down as described, and will appear like the saw in plate No. 13. This shows a saw with tight spots as they will appear when testing, such spots should be watched closely and marked as represented, to enable one to use the hammer to the best advantage. Such spots require to be hammered upon both sides in order to expand them. They are caused by the other parts of the saw being expanded more, and will make bad running saws. Very few men understand how to find these blemishes or what to do in the way of remedy. The cause of these defects are generally



CUT NO. 13.

from uneven temper; they are harder than the rest and therefore will not yield under the hammer with the same treatment, and will be necessary to hammer the saw more in the places I have represented by the dotted lines upon both sides; this will expand the hard steel and as soon as open enough they will appear true.

It is with far less labor to take out hard or stiff spots, than soft or loose ones; the loose

spots are caused by uneven temper, the softer the steel the less hammering required to open the saw. A great many do not understand why a saw will show its tight and loose spots when they have been so careful about the hammering of the saw, and also so particular in striking each blow just alike and at regular distances apart. The reason is, some portion of the saw is harder and will not yield in proportion to the same heft blow on softer portions of the saw, and are comparatively true as to tight and loose spots, but want to be opened slightly, some may think that as the saw is comparatively true when they begin, that if they are very careful in the uniformity of the work, it will not need testing after the hammering. There is not one in a dozen but what should be tested or leveled and straightened up the last thing done. In hammering one should use great judgment and care not to do too much at a time in any one thing. If you are opening the saw, go around it a few times, then try the short straight-edge, both while it is hanging up and laying down, by so doing it will show where the hammer should be used.

One should not at first open the saw as much as I recommend, if you do, by the time it is straightened and all the tight and loose spots are out, it will then be too open, and have to be opened on the rim to stiffen it, this will cause more spots to again appear, and by the time these are out again the saw may be too stiff, but if you keep the spots out as you go along, then when it is open enough it will with less labor work all right.

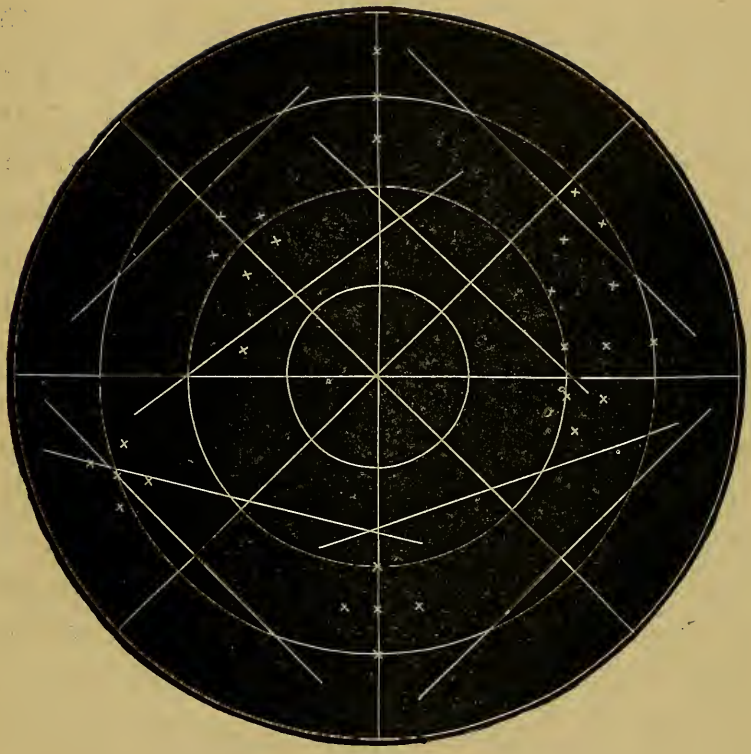
The spots should be watched for often as they are liable to appear, and mark every full spot as that will be the place to use the hammer, the loose spots have already been hammered too much.

It is generally the fault of new beginners that they use the hammer too much, and neglect the use of the straight-edge, that will not injure the saw-when the hammer will! The more you use the straight-edge and carefully mark all the imperfections detected, you can then use the hammer carefully ; the nearer you wish to come in perfecting the saw the greater should be the care taken to accomplish the undertaking, some times as you approach completion, three or four blows of the hammer

will change the saw either way, as you get the saw in shape, each blow should be lighter as you go over it. I have endeavored to show these things in as clear a light as possible, so that those who have had but little experience with the saw, may have the benefit of the years I have had to pass through in acquiring the light I have upon the subject. There is much I have gained by actual experience, which is the best way, provided the right principles are the objects to start with; of course, one must use his own judgment.

As I have before remarked, a soft saw will yield more perceptibly under the same weight blows from hammer, and will expand more in running, will show more opening when tested with the long straight-edge yet will make a good running saw.

Hard saws are the reverse of the above, they will not yield so readily under the hammer, nor will they expand as much when running, such should not drop away from the long straight-edge when being tested.



CUT NO. 14.

EXAMINATION OF SAW FOR DEFECTS.

Plate No. 14 represents a saw with application of the short straight-edge when hanging upon arbor or bench, also when standing plumb on the floor.

The short cross-lines indicate the length of

the straight-edge in proportion to the size of the saw. In doing this it should be applied in all ways, and while doing so you should stand in such a position you can get the best light, and be able to detect the slightest variation in the saw, watching the light between the straight-edge and saw so that where lumps appear mark them as indicated by the small crosses, and after examining the saw upon its sides, and all the lumps marked, place the saw upon anvil and strike a light blow with the hammer upon every place marked, after you have been over both sides, hang it up again and try it as before, until you have it as true and perfect as it well can be and need no repetition. The portion between the third line and the edge, the truer it is the nicer the saw will run.

A majority of the saw-hammerers wish to know the speed that the saw is to be run to give it the right strain, I generally hammer saws one way and when that is done right, they will do better under all circumstances, every saw should be hammered as open as it can be and not dish either way, as you get near this you can tell by the feeling of it. As I have heretofore stated that just as soon as you do too much, there

will be a snapping or jerking movement to it when shaken, there will be a snapping as the center passes from one side to the other, this indicates the saw is too open, and the nearer the center it is opened the sharper and quicker it will move.

I have seen many take hold of the center and shove it through from one side to the other, and it will remain which ever side you leave it. No saw is right in that condition. But many will say that is the right way to have saws, such saws may be too open from the collars to line 2 and too tight from 2 to 3 and will not make good lumber. This is the difficulty with ¾ of the saws in present use. I have seen a large number of saws in this condition, and many good ones condemned on this account, which might have been made to run all right in 15 minutes' time, if the true condition had been known to the Mill-Men, and they had the proper tools to do the work. Cut No. 15 represents the further examination of saws by figure No. 1, Plate 6, showing the defects with saw under the test when resting upon each edge, and laying horizontal, leaving the center to sag all that it will by its own weight, this will give a more

CUT NO. 15.

accurate rule to hammer the saw by, and you are governed by its own weight and the hardness of the metal. The straight-edge should be applied at right angles with the line upon which the saw rests across the center, and always using the long straight-edge. Plate No. 15 also shows how to apply the short straight-edge in ascertaining the tight spots, and by springing the saw first one way, then the other, or up and down. Under these

tests will be found four different kinds of defects, and should be marked as represented. The cross-lines same as shown in loose spots, plate No. 12, and the circular dots show the hard spots, these will raise up to the straight-edge when springing the saw, and will do the same on both sides, this should be marked as shown. The crosses illustrate a lump that will be visible on one side and not on the other, and thus requiring the blows upon the full side. In testing saws this way it will be best to apply the straight-edge across the saw at right angles as shown by the short lines; this will detect any buckle that may have been overlooked heretofore, and is indicated by the oval shaped dots and will appear in the testing when the saw rests upon its edge, at the end of the line running across the center of the saw, when the straight-edge is applied as shown, it will appear full and round across the line. Change the saw around and allow it to rest upon the end of the line that crosses this line in the center at right angles to it, then apply the straight-edge upon the same line where they showed before changing the saw, and parallel with it, should the saw appear

straight to the center out to the edge, this shows a buckle and will only appear on one side of the saw; and in order to remove it without getting into other trouble the long face of the hammer should be used, always holding and using the hammer in such a way that the long way of the face will be across the way that the straight-edge is applied as shown by these marks.

Heretofore I have said nothing about the long face of the hammer; this part is best in removing a twist or buckle, as this expands the saw only one way, and that is the narrow way of the face, while the round face will expand the saw in a circle. When the straight-edge shows the saw to be straight one way and rounding the other, by applying it at right angles the long face should be used the long way, always in line with the line that shows the saw to be straight.

It will be best in taking out lumps and buckle to use the pad upon the anvil, as is done in straightening the saw in all cases. I have not said anything about particular sized saws or for any particular kinds of work, my instructions have been for circular saws and

apply to any sized saws, or any thickness of plate; what is good for one saw is equally good for another. At the present day as a general thing saws are run at such a speed that under the foregoing treatment will do well, in some cases there may be exceptions to the above rule, and in such, one must use his own judgment; of course, all saws should not show the same opening under the long straight-edge, but always leave the saw as open as can be without its snapping as the center is shoved through from one side to the other, and should always appear straight when hanging upon the arbor cool, such saws when warm may dish a little, but not enough to hurt anything, providing the center is left as tight as can be. I call the center ¼ the size of the saw, this should move from one side to the other with perfect freedom, and when standing upon the floor, by leaning the saw either way, it will drop first one way then the other, without any snap or jerk to it. I have illustrated what will make as near a perfect saw as my experience has convinced me of. There no doubt will be many that will say that some things I have advocated are quite wrong, but if the instructions here

given are followed out, the majority of the saws will be benefited 10 and 15 per cent.

I have dwelt mostly on straight-gauge saws, but the same rule applies to taper ground saws, such saws should be straight on the log side, and they will straighten up when in motion so that the center of the rim will be in a line with the center of the plate at the collars, if the saw is open enough to run good.

CHANGING SAW FROM RIGHT TO LEFT AND VICE-VERSA.

Many times Taper saws are used and hammered to be run right or left-handed, if the saw is right it can be thus used, but should this not be the case, the change can be made in a few minutes by laying out the saw on the side you wish to be the log side, as shown in plate No. 7, and by giving a blow upon each cross-line where 1, 2 and 3 crosses upon the log side, this will change most any saw, but if the saw is hard, then two blows on each cross-line that could be determined by the first results. I gen-

erally fit the saw, so that both sides are alike, then they can be run on either side and equally as well. If the saw is hammered straight on the log side when standing, then when in motion it will straighten up so that both sides will be the same. When the saw is straight on one side and crowding on the other, one side is stiffer than the other, this would cause some saws to run better which would be owing to the sides of the teeth, the log side always varies the most and some neglect this side and do not keep the side of the teeth alike; one side of the saw is sharper angle to the tooth than the other, and as a general thing it is the log side that is the flattest, this will cause the saw to crowd out of the cut; such saws would run far better if they were stiffer on the outside. You can have the saw that way if you choose by following above instructions.

TO LEAD THE SAW WITH THE USE OF THE HAMMER.

Many have the idea, it is necessary to dress the saw with a lead one way or the other. Whenever a saw will not run straight, it is because it is not right. If the foregoing instructions are followed I do not think there will be any difficulty in making a perfect running saw. Many times the saw is all right or nearly so, and is inclined to go one way or the other, which is generally out of the log. In such cases if the points of the teeth are examined the log side has the most bearing surface, and many times the corner of the teeth are slightly round on this side when the other corners will be full and sharp; such may not be detected with the eye, but if both sides are dressed at the same angle the saw would run straight. Many will give the saw lead with a file. It is far less trouble to do that with the hammer, and when once done in this way will remain the same each day if the teeth are fitted square. To do this whichever way you wish to lead the saw, lay it out as in cut No. 7, and

go around the saw two or three times, once on line No. 3 and once about 2 inches nearer the center and strike on each cross-line, should twice going around not be enough, go around again about the same distance outside, this will leave the saw slightly dishing that way, causing it to incline or run that way. It is better to have the saw hammered right, with the proper shaped side-cut to the teeth, which can be had by using my bench with the side-jointer and gauge.

TO HAMMER SHINGLE SAWS.

The present way in making shingle saws requires some different mode of treatment, as they are uniformly made so heavy in the cuts that they do not generally get out of place there, but sometimes the saw gets sprung outside of the collar, they get sprung down by a spalt getting caught in the carriage, in such a case remove the saw from the collars and hang it upon the arbor, try the straight-edge upon the straight side to find where it

is too full, mark the places and use the hammer on the straight side until the saw is nearly level or true; shingle saws can be slightly dished from the edge of the collar out, this can be done in the same way as giving lead to the saw with the hammer.

If the saw is thick and driven less than 1100 revolutions per minute, it will not be necessary to open the saw much or may be slightly from the second to third line, the most that can be done is to keep it straight and true, and saws that cut both sides as they do in double block machines, should be hammered dishing nearly $\frac{1}{32}$ of an inch, some have them more than that, but I do not think it best to throw the edge up too much, the nearer straight this saw is the better it will run.

The more the edge is thrown up out of line with the center of the saw, the more the centrifugal force will draw it down, as most shingle saws run horizontal and the motion to throw it down with the gravitation, together with the block passing over it, all have a tendency to cause the saw to incline down out of the cut. The saw being thin on the edge and much smaller in diameter, the rim will not expand

enough to effect the running of it. Then the saw is furnished with a heavy collar, which prevents it from buckling. It is very essential to keep the saw true and straight, sometimes when one side may become lopped down, it can be raised with the hammer without taking off the collars, and with less work than to true it up with paper, and if the collar has not sprung it can be brought to its original place.

CROSS-CUT SAWS AND THEIR CARE.

There are but few men that take any care of a cut-off saw. In their use for cutting slabs it does not matter much with them, but as a general thing there are more broken cut-off saws in mills than of any other class, owing chiefly to carelessnes and want of the right care.

Nearly every one files the front of the teeth on a bevel clean to the bottom, such teeth make very hard running saws, the reason is the front of the teeth forms a wedge which causes the

saw-dust to be driven each side of the cut, and in heavy cuts it will wedge so that they are often broken from this cause.

The best for the tooth is to give it more hook than is usual, and dress it square in front up to 1/8 of an inch of the point, this much can be beveled and gives the same cutting front, the bottom being square will carry the dust straight ahead causing the saw to run lighter. Such saws with the above treatment, will be less liable to become bent and kinked or to run bad, and to more fully overcome these things, heretofore more set has been given, which causes the saw to cut harder. The saw can be hammered the same as a Rip saw, the same instructions will apply to the cut- off-saws.

I have heretofore been very plain and explicit in regard to circular saws, as they are more delicate and sensitive than any other class, and requiring more skill in their management; and next in order will be the

GANG SAW.

These saws at present are but little understood, and I have found but few who could give me much light upon them. I have asked every man that I have come across, who has had the care of gang and saw, to give me a positive rule to get the best shape of the teeth, so as to bring it in contact with the timber in such a way that it will cut the best

I have found as the best way to hang the saw, and one that will apply to any gate; and also that will permit the saw to strike the cut in such a way as to cause the gate to strike easy without pounding or lifting, as either will cause the saw to run bad. There is a point in the revolution of the crank where the crank-pin should be when the saw takes hold of the timber, or if the saw strikes the cut before the crank arrives at a certain point it will cause the shaft to lift, and the floor timber to spring, jar or pound. It is well understood by everyone that runs a gang, that there must not be any lost motion in any of the movements, but some have been troubled in keeping the gang from

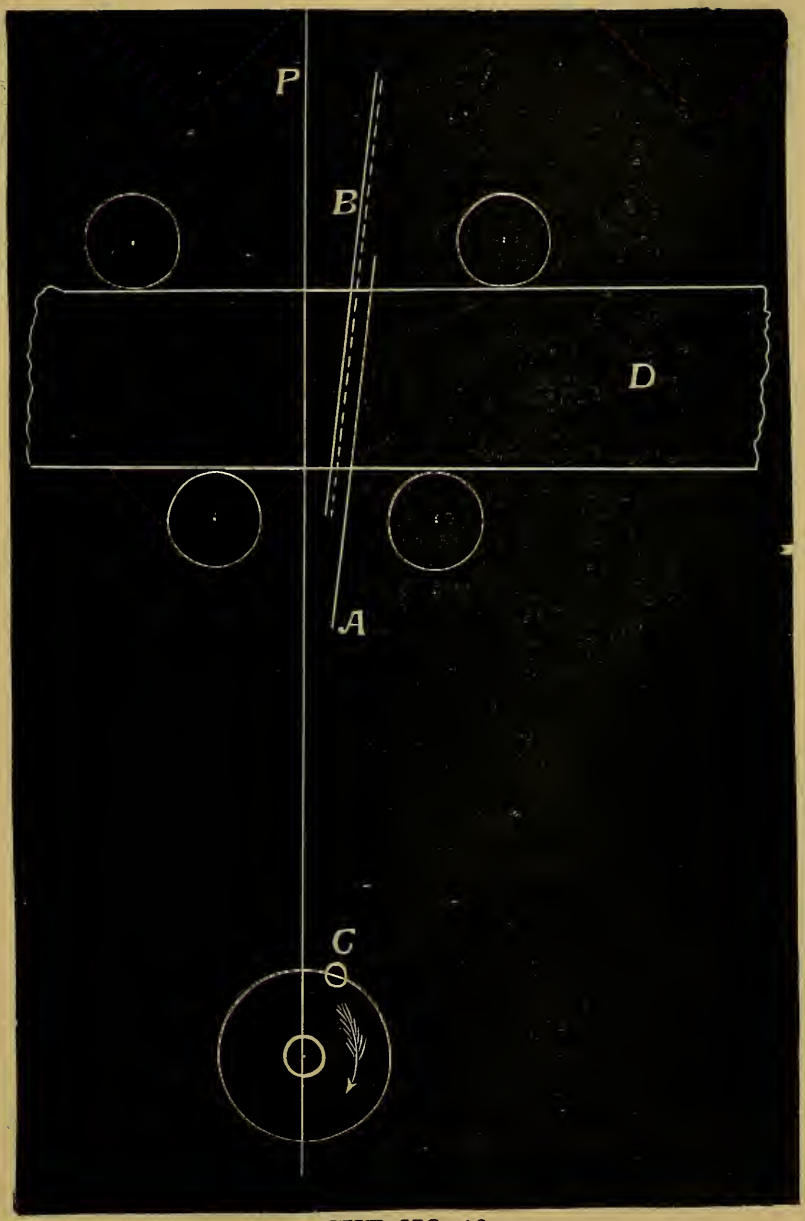
pounding; and many times this is a great source of annoyance and break-down, causing heavy expense with much unnecessary wear on machinery.

TO HANG GANG SAWS.

There are a great variety of gangs with much difference in the movement of the gates.

In hanging gang-saws they should be hung so the saw will come in contact with the timber at a certain point of the stroke. It makes no difference what kind of movement the gate has, the saw should take hold of the timber at the right point to make a smooth running gate, some oscillating ones bring the saw in contact with the timber in a way that makes the gate strike lighter and better.

Cut No. 16 is illustrative of the plainest and simplest rule to hang gang saws; one that will apply to any gang, and show the exact point where the crank should be when the saw comes in contact with the timber. Some os-



CUT NO. 16.

cillating gates move the bottom of the saw forward first, making an under cut, and then throws forward on top and back on the bottom, making what is known as the whip-saw movement, such movement makes the easiest cutting gate, although many get the movement changed and have no rule or guide to go by, illustrating how they can get it to rights again, and I have seen men to have worked a whole season, trying to get the gate right and to have failed in the end, this rule applies to any kind of a gate, and when understood can be applied without much labor and will enable almost any one to hang the saw so that it will work the best, C represents crank showing the exact point where it should be when the saw comes in contact with the timber. By measuring from line P one-sixteenth of the revolution of crank, forward of the line as shown in the cut. P is a plumb line from the center of crank-shaft. A is the line of the cut of saw, when the crank is on the lower center. B is the line of the saw when the crank is upon the upper center. D is a plank the same width as the stroke of the gate, this plank should rest on the edge upon the feed-rolls, and the press-rolls allowed to rest

upon it to keep it upright as shown in cut 16.

Straight slide-gates require some overhang to the saw, and some oscillating gates; some gates are thrown forward by throwing the bottom of the upper slide forward, this throws the saw forward until the crank reaches the bottom of the stroke, and then as soon as the saw commences to raise, it throws the saw back clear of the cut, such gates the saw does not require so much overhang, and some not any, as the slides give the saw the same forward movement, yet that does not make any difference as to testing by this rule the movement of saw.

This is simply the best and quickest way, and the only one I have ever found that will successfully work on all kinds of gates, and show the exact motion of the saw. In practicing by this rule, the first thing necessary will be to make up your mind the amount of feed you wish to carry, for example, I will take ½ inch. To hang the saws suitable for that in straight-slide gates, the saw should have an overhang of one-half the feed, and $\frac{1}{16}$ of the half inch would be $\frac{1}{32}$ or $\frac{9}{32}$ of an inch in the length of the stroke for ½ inch feed, this is for friction or continuous feed, but for hitch or rachet feed, the

overhang should be 1/6 more than the whole feed.

For example, for 1/2 inch feed, the overhang should be 17/32 that is 1/16 more than the feed in the length of the stroke, always go by the length of stroke and not by length of saw, you can go by twice the length of stroke and twice the above overhang, or 1/16 more than the whole of the feed. In case your gate is an oscillating one hang the saw as usual and test the hanging by this rule.

The way to test the hanging of saws is to remove all of them, and then hang one saw in the gate with the teeth to the back, giving the saw the usual overhang or in accordance with the amount of feed you wish to carry, by hanging the saw with the back forward, you can mark down the edge better than if it were hung right side to the cut.

After the saw is hung, take a plank the width of the stroke and dress it smooth so that a fine mark would show, and set it as shown by D, close to the saw. The press-rolls to keep it upright and also to allow the feed-rolls to move it the same as the cant is. After this is set turn the crank-shaft slowly until the

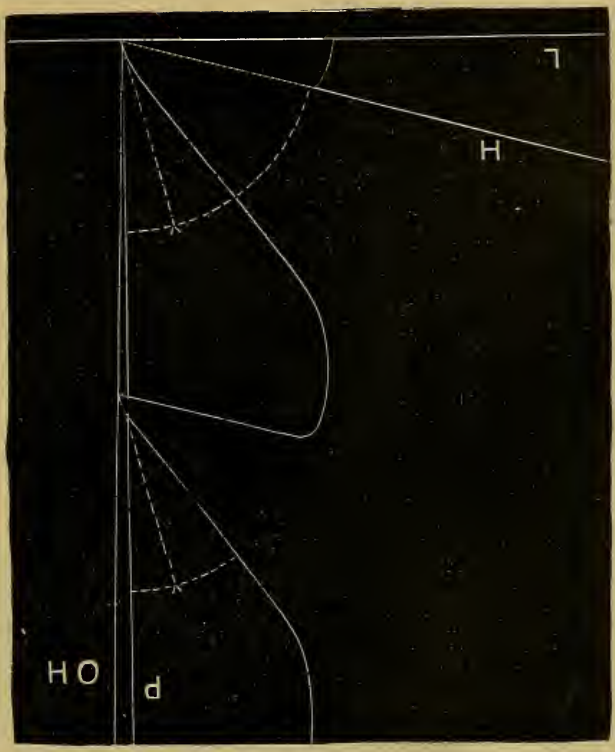
crank is on the lower center, mark down the edge of the saw shown by line A, then turn the shaft until the crank stands as shown by C. This should be done accurate, setting the crank $\frac{1}{16}$ of the revolution.

If the saw is hung right, the edge of the saw and the line marked on the plank shown by A they will just come together; but should they pass each other, there is not oscillation or overhang enough to the saw for the feed, but if they do not come together there is too much oscillation or overhang to the saw. In the latter case more feed can be carried and the gate will strike better, and where the feed is not enough for the overhang will cause the gate to pound on the down stroke, or a chucking motion causing the cant to be driven back and prevent from feeding up to the regular feed. The saw under such a state of affairs is more likely to clog by reason of the saw striking the cut after the crank has passed the designated point.

After the crank has passed this point, the gate begins to descend with greater rapidity, and when the saw strikes the cut on the

descent, will cause the saw to buckle and spring, causing the cant to give back.

If the saw has not enough overhang or oscillation the saw will take hold of the cut before it begins to descend and while standing; this causes a lifting or pounding motion to the gate. Less feed will relieve this difficulty, but to carry the desired feed it will be best to overhang the saw or give more oscillation, and until lines A and B come together as shown by dotted line when the crank is at the desired point; this is where the gate begins to descend, and at this point, if the saw takes hold of the timber it will not take near the power to drive the gate as you get the heft of the gate to drive the saw through the cut. Whenever the saw takes hold before reaching this point, they are nearly stationary, and in coming in contact with the timber will cause them to remain standing and will require more power to start the gate, and this lifts on the shaft, which under this treatment there is more strain on the machinery, but not so much danger of the saw buckling as when there is too much overhang. When saws are hung as described at least 25 per cent. more feed can be carried as a general



CUT NO. 17.

thing. This cut simply shows the outline of the rule giving such points as are necessary to make it plain to mill-men, and giving a positive rule for hanging saws which is applicable to any kind of a movement, where the slides are set on an incline, the slide can be changed until the line A and B come together, and the crank is at the specified point.

These points are very essential for good

running saws. Many get the saw hung very near right but cannot tell how they do it, yet by repeatedly trying they do it very well.

The next thing to be understood is the shape of the teeth, how to set and keep them so.

TO MAKE THE BEST SHAPED TEETH.

This is a consideration with Gang Saws that but very little attention is paid to. The tooth should not be too long nor too short, neither too heavy or too light, but should have the desired hook and the right shape back to make an easy cutting tooth, and must be of some one shape preferable to another.

It is the same with Gangs as with Circular, a gang tooth should come in contact with the timber at the same angle or degree. I have made inquiries of a great many men how to get the right shaped tooth, but the general reply is about so and so is the best and cannot give any particular rule or way to follow. The following cut No. 17 will give a fixed and positive rule

how to make the best shaped tooth, one that will give the right angle or hook to the bottom regardless the way the saw is hung in the gate. This cut shows the tooth full size that are generally being run with the saws used. The following description will enable any one to lay out this tooth. First hang the saw with the right overhang or oscillation for it to get the right hook, drop the gate half way down, this is the point where the oscillation is the most, place a parallel straight-edge on the Feed Rollers, shown by line L, allowing the teeth to rest on the top, measure from the point of tooth back the same distance as is the stroke of the gate (for example), say 20 inches from the point of tooth, at this place fasten a post or stick at right angle with line L, measure one-fourth the diameter of the stroke, as 20 is the whole, 5 is one-fourth, place another straight-edge at the point of the tooth, and the other end 5 inches above the line L, make a mark on the tooth from the point back the depth of the tooth, this gives a quarter hook to diameter of the stroke the same as the hook of circular saw, the depth of the tooth is best not more than one-half the distance apart on a one

and half-inch tooth, ¾ is plenty deep enough to carry all the feed usually carried. I can carry on a tooth of this description ⅞ of an inch feed without choking.

To get the right shape to the back, measure from line L at the base of the tooth up to line H, then place a straight-edge against the front of the teeth shown by line O H, strike a circular line from the base of the tooth as shown by the dotted line, then measure from the face of the teeth back the same distance on the circular dotted line as it is from L to H at the bottom of tooth, then strike a line from the point of tooth as shown by straight-dotted lines, this causes the point of tooth to come in contact with the timber both sides alike, also gives the right shaped tooth on the point, just about the same as what is made when the tooth is pointed down with the hammer, and prevents the saw from drawing into the timber and buckling, the tooth should be cut out as shown to make necessary room for saw-dust.

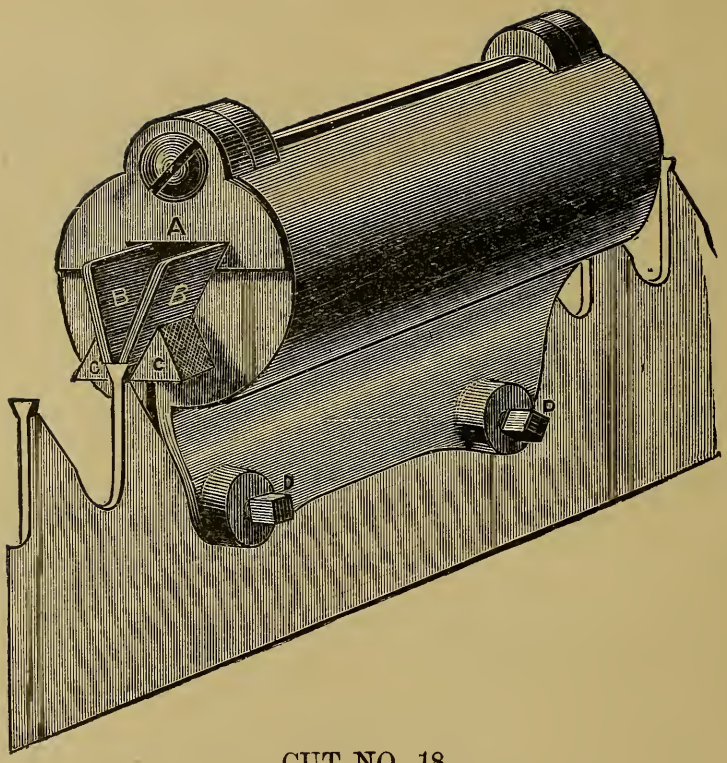
This makes the best shaped gang-tooth that I have ever been able to find; after you have these lines on one tooth make a pattern and lay

out each tooth by it, that will be right for that gate.

With the old way of filing, it is impossible for any to maintain them, but if my Saw-Sharpener is used and set to one tooth it will make every tooth like it and keep them just right. The tooth does not get shorter or loose; the hook, which alone is of vast importance to the saw gangs or others, and where there is a successful way for saws to be what is desired, that should unhesitatingly be adopted.

The cut showing the shape of sides of the teeth of circular saws is applicable to gang teeth, and should be fitted with the same care, to facilitate the dressing of the sides to give the desired side-cut as shown in plate 2.

My Side-Jointer perfects that with more eveness than can be done with any other tool now in use.



CUT NO. 18.

"SIDE-JOINTER."

The following cut represents this little tool which will save daily the price of it in the majority of mills. Plate 18 shows this tool applied to the saw, showing the shape of the tooth that will produce the side-cut which will enable a saw to carry more feed and less liable to clog.

C. C. represents two three cornered files set at the right angle to form the outside corners, they are set both alike giving the same angle to each side of saw teeth. B B is two guides or rests to govern the cut of files, and they act as a clamp to hold the files, also take the place of a top jointer. A is a latch to prevent the sides from opening too far, upon the other end is a wire spring that holds the sides of the jointer open to admit of adjusting it upon the saw, when using, press the sides together with the hand until the files come in contact with the saw-teeth, then shove the jointer from one end of the saw to the other until the teeth are dressed to a uniform gauge, regulated by set-screws D D.

It will be readily understood by every millman the great advantage to be derived by the use of such a tool, both in saving of time of side-dressing and gauging the teeth, more particularly with full swaged tooth, also the advantage of having the set uniform and true, as this increases the quality of the lumber and will enable the saws to make more. I speak of the improved tools that I have, for assisting Sawyers and Filers in the care of saws, any thing that will

save time and tend to facilitate in the manufacture of lumber, should be sought for by all thus engaged.

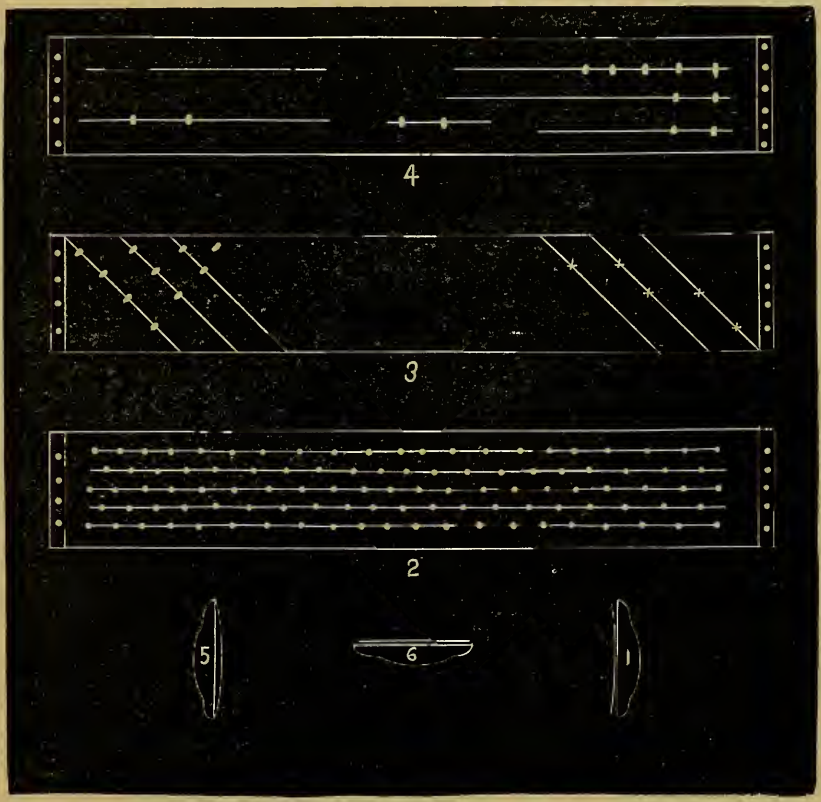
TO HAMMER GANG-SAWS.

At the present time but few men understand how to hammer the Gang-Saw, and many more do not know as they ever require hammering more than to straighten them. It is just as essential that gang-saws should be hammered in order to give them the right strain and to fit them to make better lumber.

I have been in a great many gang-mills and never found but few men that could do this.

I have never found a set of saws made right that has come from any shop, yet this is a new feature in the care of them, when a set of saws are hammered right they will stand up to 35 per cent. more feed on the average. In order to do this work one should have the right kind of tools which consist of a hammer with a round face such as I send with machines. I prefer this kind of one rather than have two or more

as some do ; one wants a good anvil smooth and hard faced, oval or full, to enable you to draw the saw at the desired place. The next is a true straight-edge 8 or 10 inches in length. Plate No. 19 show three gang-saws and how to lay them out preparatory to hammering them.



CUT NO. 19.

It represents the straight-edge applied to the saw and as you will find the majority of gang-

saws. this shows the edge of the saw dropped away from it, as it is applied across the saw when one end is held in the left-hand and the other resting upon a bench, and the center sprung down by its own weight. Apply the straight-edge to the other side and it will appear the same way. 2 represents this saw upon the side laid out ready for hammering. It is better to lay out the work by the right system in order to help new beginners.

This saw is very tight in the center and open or long on the edges, such saws cannot be properly strained, the edges being the longest, when the saw is hung in the gate and the key drove, the strain is through the center of the plate, this leaves the edge loose, such saws will dodge and make snaky lumber, and as long as the center of the saw is the tightest the edge will buckle. Such saws will not carry half the feed that one will when just the reverse like 5. 2 has five lines of blows through the center. It is best at first to go along the center line, then the two outside ones, then turn the saw and do the same thing, if that does not open it enough, go over the other two lines on both sides the same, if that does not open enough, go over the saw

as at first, but not so many blows on them.

The saw should drop away from the straight-edge all that it will by its own weight when resting upon both ends, and when held up edgewise that it will appear straight as shown by C. If the saw is opened too much it will somewhat assume the form of a letter S, in such case the edges should be opened, and this will allow the saw to straighten out; always use the hammer on the full side, saws in this condition when strained in the gate are tighter on the edges, and will keep the saw firm and not allow it to dodge. This is quite a job where a whole gang of saws are taken, but they can be done a few at a time. No. 3 represents a twisted saw and also how to apply the straight-edge, shown by the lines running across the saw, if the straight-edge is applied the other way it would appear straight. You will use the long-faced hammer shown by the oval dots on one end and crosses on the other; they show where the trouble is, and the same rule as is applicable to circular saws.

In regard to getting out the winde or twist, the lines show the way the straight-edge is to be applied, and the long way of

the hammer should cross these at right-angles with the marks, the end where the crosses are, wants to be turned over and the blows applied on the opposite side, invariably striking the saw on the full spots or rounding side. Always use the long-faced hammer on twisted saws, and many times it would be best to use a pad on the anvil when straightening, if the saw is open enough. As is often the case that saws will get bent or twisted by a piece of bark or sliver getting wedged in between the saws; many use a wooden block for this purpose, in place of an anvil which is very good. Fig. 4 shows a saw bent but not twisted; by applying the tests as shown, the dots represent the full spots; the blows of the hammer will take such spots out and straighten the saw.

In hammering gang-saws they should appear straight, no lumps or open spots on them; use the short straight-edge in straightening them, and not trust to the eye. Gang-saws should be made as limber as they can be made, that will admit of straining them better in the gate. When the saw is opened in the center as I have instructed, and strained

in the gate, both the front and back edges will be of like strain ; this will prevent the saw from buckling, and such will stand from 25 to 50 per cent. more feed and make better lumber.

The trouble with most of the gang-saws they are gummed with the press-gummer, this expands the edge of saw, leaving the center tight, and any slight pressure buckles the saw, and it cannot carry at the best more than ½ inch feed without dodging, but after the saw has been opened it will carry from ¾ to one inch feed as well as it had ½ inch before.

It is no trouble to make 16 gauge saws stand ⅝ to ¾ inch feed, providing they are opened in the center and have the right shaped tooth and side dressed to give the right angle to the side. No saw should be pressed gummed, it will take three times as long to get the saw straightened and opened as it should be after gumming, than it takes to gum it out.

If my Saw-Sharpener is used it prevents the stretching of the edge of saw and keeps the right shaped tooth, after it is once fitted and got in shape the machine keeps them so.

The instructions I have given in regard to

gang-saws will enable all to improve the running of the gang. I have never found a man that understood all that I have given in regard to gangs, and some use one thing some another, but I have made it a point to gather together all the best tests experimentally and otherwise, and present them in this form so that who may desire can have the benefit of them.

MULAY SAWS.

They are to be hammered differently and require to be as stiff as can be made. In order to make a saw stiff it must have an even strain, which is done by hammering the plate alike, and if the center drops away from the straight-edge when the saw rests on both ends and the straight-edge is applied across the saw, the edges must be hammered; should the edges drop away as shown in gang, the center must be opened until the straight-edge touches the whole width on both sides. By close observation when you begin, it will not be long before you will get the whole thing. All imper-

fections in the Mulay can be overcome the same as in gang, and same instructions applicable to them.

DRAG SAWS.

They are the same as the Mulay, with same instructions applied.

HAND SAWS.

These saws can be bettered many times by hammering the kinks out, and stiffened up the same as the Mulay. All saws that are not strained should be made as stiff as is possible and free from buckles.

LARGE BAND SAWS.

To many these are a new saw and a few suggestions as to the care of them may benefit some. Owing to the thinness of the plate it will require more than ordinary care in enabling them to do good work.

They get kinks and lumps in them rendering it necessary to have more set, and those that have the care of them should understand the use and benefit of the hammer. They are very apt to break and when they do are sure to get bent more or less, and whenever that occurs, the result will be a buckle after they are straightened if one does not understand taking them out. To hammer them the anvil must be upon a bench, so that one side can be directly under the anvil in order to allow the other side to lay flat on its face, the anvil should set by side of the building, or where you can have two wheels to carry the saw, and these wheels to be so arranged that they can be raised and lowered so that both sides of the saw can be raised over the anvil, this will give an opportunity to work upon the inside of the saw, then drop the wheels so

that the top will rest on the anvil. These wheels should be so that the saw can be stretched when it hangs upon them, and when the saw is stretched the top should hang on a line with the face of anvil, as this will admit of working on both sides, which is necessary to do a good job. If you do not have the saw so you can handle it right, it would be best not to undertake as the saw is thin and would be apt to get bent or kink in it, and whenever the saw gets a buckle or stiff spot it may not show to the eye, but in running, the stiff-spots are sure to buckle the saw in a short time.

These saws should be hammered the same as gang-saw, so that when the straight-edge is applied across the saw, it should drop away all you can make it to in the center, and still appear straight-across when the straight-edge is applied and the saw sitting up edgewise. No saw should appear any other way than straight when the straight-edge is applied perpendicular, but when applied horizontal it should drop away all that it will alike on both sides.

These saws are more troublesome to get right, they being such length and difficult to handle, requiring much time in testing them.

After you have hammered the saw open through the center so that the edges will be straight, then place it upon the filing bench which should also be supplied with two wheels large enough to allow the saw to hang free and not bend the plate, these wheels must be so the saw can be strained tight, after the saw is strained and there is nothing to interfere with it, apply the straight-edge perpendicular and at an angle of 45 degrees on both sides, this will show any twist or lump that will not show when tested on the side.

Go around the saw and mark all the defects you may find, then remove the saw back to anvil, and in straightening the saw on both sides test it when in this position, and if you do not find any stiff spots, remove it back to the filing bench and try it again to see if there are any more defects.

The saw should be handled with care so as not to bend the same too sharp, as in so doing would render it stiffer in the bends, and as the saw is running over the pully this bending and straightening will cause it to break in the stiff spots. Some try to handle the saw without suitable wheels to carry the saw when filing, but

lay it on pins or rests. In this way it is very apt to get twists and kinks in it, and in order to find these defects the saw should be strained but not so much as when running. It is a very suitable place to test the saw when it hangs upon the driving pulleys, by slacking the guides so that it will hang free, then apply the straight-edge both length and acrosswise and each way at an angle of 45 degrees, this will detect any imperfections that may be in the saw, marking at the same time such defects as may appear, and use the hammer until they are removed.

This is the most difficult saw of any in use to keep in order, both in hammering and filing.

My machine is the only one that will fit this kind of saw. Many use too deep a tooth and then carry too much set. In order to make these saws run good the teeth should be sprung the same as any spring set tooth.

They should be done so, close to the point; and not carrying any more set than is necessary to clear the plate, the truer the plate the less set can be carried, as soon as the saw gets bent more set will be required to clear the plate. I have endeavored to give such points discovered

as will be beneficial in their care, and as the band saw is comparatively new, there may yet be many discoveries that will be beneficial to them. On this subject I have endeavored to be as plain and comprehensive as possible as also the different ones preceding this, which I trust may be of intrinsic value to all interested.

CONCLUSION.

I have in the foregoing deemed it advisable to detail elaborately upon the most essential machines and tools, together with their usage and treatment spoken of or refered to in this the "Handy Guide," designed and compiled for the benefit of Mill-Men and Saw-Filers, relative to the Hammering of Saws, and what can be accomplished by them when kept in the condition I have illustrated they should be, how and by what method the best results may be obtained when the instructions this book has been designed to give are carried into effect.

I would also in this connection state that my

Saw-Sharpener, which has heretofore been brought to notice many times in subjects treated upon, and of the general favor bestowed upon it by all who have become familiar with the advantages derived from it.

Would also add here that the general lack in mills for the right facilities to keep the saw in the order it should be kept in for its successful work, and too, for something reliable and much needed in connection with the saw-sharpener, has been fully met by my portable saw bench, and will be found to be an indispensable machine to mill-men.

As the hammering of saws has been but very little understood in the past, and is of vast importance to the successful running of the saw. I feel it a duty to prominently mention this as one of the greatest acquisitions to the mill.

I would also speak of the intrinsic worth of the side-jointer. See plate 18 for side-jointing the teeth, which also mention has been made under the appropriate head, as index will refer to, in detail with other subjects connected with the care and usage of the saw, and to be found in their several allotted places in this book.

As my saw-sharpeners (see cuts Nos. 20

and 21), have become pretty well known, and given universal satisfaction to all who have had them, I feel it due to mill-men and myself, that I make quite an extended claim for its merits. It is but a very few years since being brought into notice, and during the time I have made many improvements regardless of time and expense, and now claim, as I have heretofore, that they are the best machine of the kind in this or any other country, and the most perfect of any ever introduced into a mill; has been and now are acknowledged so by every unprejudiced person who has ever used them, and gained a reputation that no other machine of the kind has.

I claim for them a great saving in saws, labor and files, and to do perfect work. Its use dispenses with gumming and leaves the saw round and in perfect balance; is adapted equally to the gang and large band saws as to the circular saw, every tooth dressed after a form, and therefore, all alike, and can make any given shaped tooth, can be square or bevel with any desired hook; lead can be given saw from top, bottom or both, as may be desired. Saws sharpened by this machine

can be two or three gauges thinner, requires less set and stand more feed than any other way of sharpening; leaves a fine polished edge on the tooth, and holds the edge better than any other way of dressing; the surface of the steel when dressed with emery wheel is harder and more compact (not case-hardened) but the edges of teeth wear longer.

The benefits to be gained cannot be fully understood by any one without trying the machine.

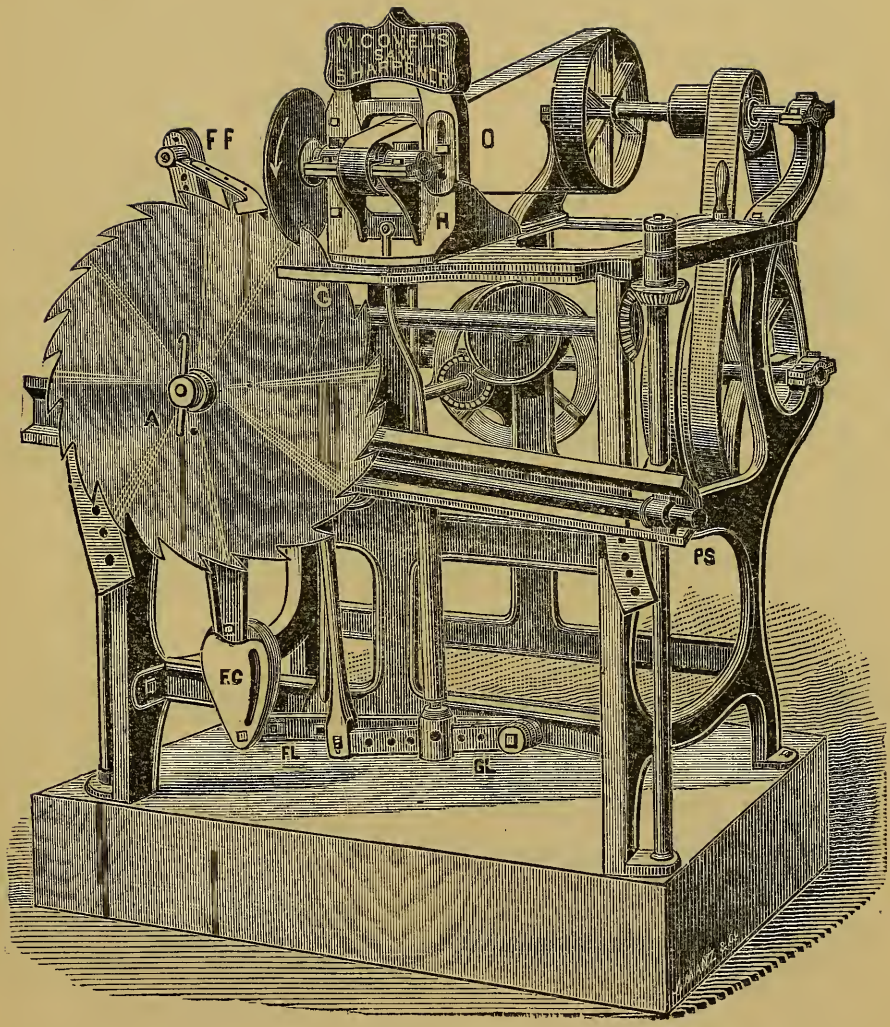
It is not my desire to impose upon millmen any machine or tool I have to or may offer, unless they are all I claim them to be. For the general treatment of saws and such other information connected therewith that will be of interest I would refer to the subjects as they appear in the index, and if anything connected with these subjects are not fully understood, by corresponding with me I would gladly give such information asked for, that without doubt would be satisfactory. I am familiar with the best machinery in use for the care of saws, and fully prepared to furnish any machines or tools that may be required and at the lowest prices.

And as a specialty in emery wheels, from my own experience, I shall furnish such as I can fully vouch for, and at manufacturers' prices.

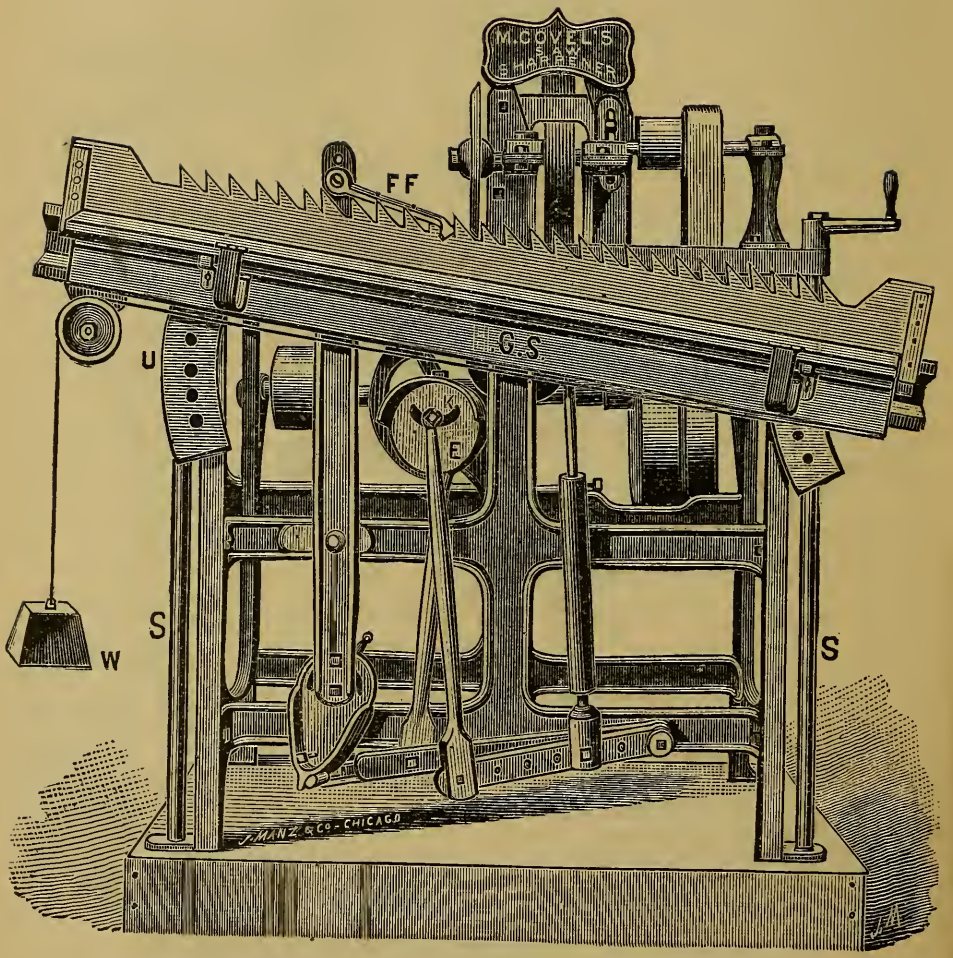
Proprietors of lumber mills who are not supplied with these labor-saving machines and tools that mention has been made of in this book, will find it to their interest to correspond with me at their earliest convenience, as I claim that the advantages gained by the saw-sharpener, independent of any other machine or tool I have mentioned will be sufficient to pay for it in ninety days; other things mentioned have their relative and intrinsic worth in conjunction with the saw-sharpener.

I will not expect everyone to order a machine or other things I have offered, if they should, it would be impossible to fill all orders; yet a few wish to excel in their business, and from such I expect patronage; and those who may favor me with their orders, I will fully satisfy of all I claim.

I deem it may be well to insert as the "finale" to this book, testimonials from some of the mill-owners in Muskegon, Michigan, where a large number of my machines have



CUT NO. 20.



CUT NO. 21.

been introduced, and too, before important improvements that I have since made to them, which fully substantiate all that I claim, and this being the expression of all that have used them, I will, in connection to the foregoing, add an extract of quite a lengthy notice that appeared in a periodical published in this city.

M. COVEL, Patentee and Proprietor,
259 E. Randolph St.,
Chicago, Ills.

TESTIMONIALS.

The following testimonials are from some of the mill-owners of Muskegon, where a large number of them have been introduced, which fully substantiate all that I claim, and as this is the expression of all that use them it is not necessary to add any more :

MUSKEGON, June 29, 1878.

M. Covel, Chicago, Ill.

DEAR SIR :—The saw-sharpener which we have in use in our mill does its work well, and we think makes a saving to us of $6.00 per day in labor and files. We are now running thirteen gauge saws in our gang and carry

three-quarter inch feed, and have two more saws in the gate than when we began using your machine. Yours truly,

HACKLEY, McGORDEN & CO.

MUSKEGON, April 11, 1878.

M. Covel, Chicago, Ill.

DEAR SIR: — The two sharpeners manufactured by you for us, are the only sharpeners that we have ever found. They more than take the place of files, keeping our saws in perfect condition. We think no mill-man would be without them afer using them.

Respectfully yours,

RYERSON, HILLS & CO.

MUSKEGON, July 6, 1878.

M. Covel, Chicago, Ill.

DEAR SIR: — We cut 180,000 feet of lumber per day during the running season, using two circulars and a gang. Have had two of M. Covel's patent saw sharpeners in use nearly a year. Never use a file on our saws and they run better and will last twice as long. We

save the time of two men with this saw-sharpener, which is the only one we have ever seen.

Yours truly,
TORRENT & ARMS LUMBER CO.

MUSKEGON, July 5, 1878.

M. Covel, Chicago, Ill.

DEAR SIR :—Our saw-sharpeners are doing well. Our saws will last a year longer than if we used files, and we cut 5000 feet more lumber per day and do the work better. We would not do without it in our mill, and think they make a saving to us in saws, labor and files of at least $10.00 per day. Our average daily cut is 150,000 feet throughout the season. Have two circulars and a gang.

Truly yours,
HAMILTON, GERRISH & CO.

MUSKEGON, July 11, 1878.

M. Covel, Chicago, Ill.

DEAR SIR :—Your automatic saw-sharpener works well and gives good satisfaction. We find a great saving in labor and files.

Yours, &c.,
C. DAVIS & CO.

MUSKEGON, July 17, 1878.

M. Covel, Chicago, Ill.

DEAR SIR :—I have one of your saw-sharpeners working on sixteen gauge saws with teeth seven-eighths of an inch apart, and I think it works splendidly. It has given good satisfaction, keeping teeth even length and gummed, ready for work at all times. I think no mill-man would be without one after using it. Yours respectfully,

T. S. FARR, Agent.

EXTRACT FROM THE "NORTH WESTERN MANUFACTURER" AS FOLLOWS.

One of the greatest Industries of the Northwest is the manufacture of lumber. Millions of money are invested in the industry, and tens of thousands of people are directly engaged in carrying it on.

Improvements therefore in any branch of the business of manufacturing lumber—whether in machinery or in the mode of operation — will be almost of general interest.

We have seen a machine invented and manufactured by M. Covel of this city for automatically sharpening saws, in which every lumber manufacturer or person interested in this industry must be interested.

Manufacturers of lumber, lath and shingles, have long felt the need of just such a machine as Mr. Covel has to offer them, which not only enables them to improve the quality of their products, but at the same time is cheaper.

It is fully understood that the more perfectly a saw is sharpened, the more lumber it will cut, and the better it will do it. As we understand, formerly an expert was employed in each mill, at high wages, to file saws, but all progressive, intelligent and enterprising lumber manufacturers now-a-days avail themselves of the improvements that have been made by ingenious mechanics and practical men, who have devoted time, talent and money to the invention of labor-saving machines for this purpose.

Of course all these inventions have not proved successful, but the saw-sharpener has been deemed by many of the most extensive lumber

manufacturers in the West as nearly perfect for the purpose intended as a machine can be made, and to fully accomplish all that is claimed for it by the inventor.

As an evidence of the estimation in which it is held, we give this little incident.

The proprietor of one of the most complete lumber mills in the West, after showing us over the mill and pointing to the improvements, remarked, "and now I must show you my pet which I have reserved for the last," when he led the way to a neat little room devoted to the saw-sharpener, which was industriously working away, doing its duty like a thing of life and intelligence.

These machines are now being manufactured by the inventor and patentee,

M. COVEL,

259 E. Randolph St., Chicago, Ill.

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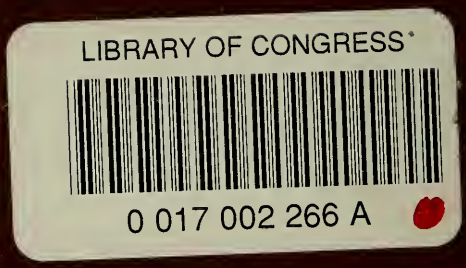
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